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**JOURNAL**  
**OF THE**  
**ASIATIC SOCIETY**  
**OF**  
**BENGAL.**

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**EDITED BY THE SECRETARY.**

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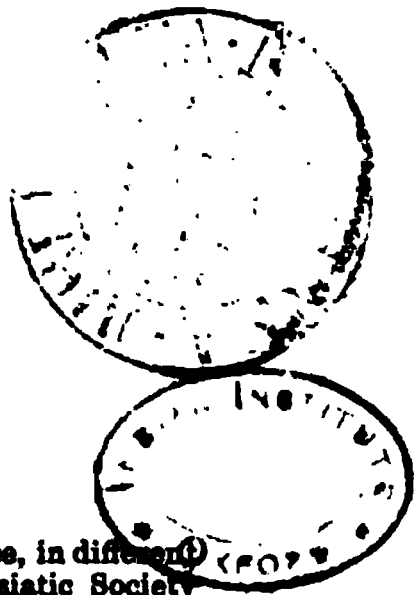
**VOL. XI.**

**PART I. JANUARY TO JUNE, 1842.**

**NEW SERIES.**

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"It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science, in different parts of Asia will commit their observations to writing, and send them to the Asiatic Society in Calcutta; it will languish, if such communications shall be long intermitted; and will die away, if they shall entirely cease."—SIR WM. JONES.



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# JOURNAL

OF THE

## ASIATIC SOCIETY.

*Extract of a Letter from Dr. JAMESON to Mr. CLERK.*

In Camp, Kalabagh on the Indus, November 15th 1841.

Since the 13th ultimo I have been engaged in examining the country between this and Mare. It is not my intention at present to give you any detailed account of the district that I have surveyed, as I am still among the same series of rocks ; viz. Saliferous system ; which extends uninterruptedly from this to Jubalpore.

The coal met with at Kalabagh occurs in thin seams, in a white sandstone that alternates with the red marls in which the rock salt and gypsum are imbedded. The largest seam is in breadth about seventeen inches, consisting partly of coal, sandstone, and mineral sulphur. Already about two thousand maunds have been collected, and brought to the town, which is on the banks of the Indus, from the different localities ; but the people have such ideas of its value, it being used by them for medicinal purposes only, as to demand a most exorbitant price for it, viz. four rupees per pukka maund !

A boat belonging to the Hon'ble Company has been here for five months waiting the delivery of the coal, but the orders issued by the Malik, (Governor,) of the district are, that until it is paid for, none is to be delivered. As the seams from whence the small quantity of coal procured are, owing to their thinness, of no value, and not worth working I shall spend some time here in order to make a minute survey ; I shall then proceed up the river as far as Sharki in the boat, there being no route along either bank, in order to examine the geolo-

gical structure of the country, and at the same time to ascertain if any coal worth working is to be met with.

To the question,—Is any good coal likely to be found in quantity in this district? we would at once answer decidedly in the negative.

In Europe, America, New Holland, &c. the bituminous coal alone is met with in the carboniferous series of rocks. The oldest rock met with between Jabalpure and Kalabagh is magnesian limestone; resting on it we have red sandstone of Europe; on it red marl, in which occur imbedded the rock salt and gypsum, or sulphate of lime, which yields the celebrated plaster of Paris; and alternating with the red marl at Kalabagh there is a white sandstone in which coal and sulphur occur, and alum slate from which alum is manufactured in large quantities; there being in the town fourteen manufactories. In a limestone filled with organic remains, probably the equivalent of the Muschelkalk of Germany, iron ores (red and brown hematite) occur, forming enormous beds. On the banks of the river the sand is extensively washed for gold. And lastly, rock salt and gypsum occur, forming mountains from five to six hundred feet in height.

Such is a rapid account of the riches of this district; and there are few, if any districts in the world where iron, gold, sulphur, salt, gypsum, limestone, saltpetre, and coal are met with in such quantity; and all that is wanted to raise this to one of the most important cities in India, is coal in quantity, enterprise, and a hand to guide.

From the enumeration of the rocks above you will perceive that all are newer than the carboniferous series, the position of the magnesian limestone being immediately above that series in Europe. Sometimes a conglomerate is met with between the sandstone of the coal formation, but that is rare; hence it is known by the local name of the Exeter red conglomerate, Exeter being the locality where it is well developed. From this fact we conclude, that *no coal worth working will be found* in this district. Other seams may be found, and which may yield a few thousand maunds, but no supply to any extent will ever be procured. The coal now met with is partly brown coal (lignite) and partly jet, and *not true bituminous coal*; it however is, from the experiments on a small scale here made, well adapted for steam vessels, &c. burning as it does with good flame, emitting much gas, and at the same time having but a small quantity of earthy matter.

Below the carboniferous series there is another kind of coal met with in the primitive and transition series, viz. glaucous coal, or anthracite, a non-bituminous coal, which is now extensively used, particularly in America, in steam vessels, but as these rocks are still older than the carboniferous series, none are met with here in situ.

We have made these observations in order that you may decide what is to be done with the small quantity which has been collected. For my own part, I think that the boat might as well have remained where it was, or rather that the individual or individuals who preceded me, ought to have given it as his or their opinion, that the supply would never be commensurate with the demand, even for a single vessel for a few months; and that at the same time the collecting of coal from such small seams would incur great expense to Government. But no doubt the alum slate, which is of a deep black colour, and which occurs in many places along with the coal, was confounded with it, and led to the supposition that coal was to be met with in quantity.

If you think it necessary to send to Bombay any of the coal collected, I may mention that individuals who remove the alum slate from mines here to the place where the coal seams occur, receive one rupee for every sixteen pukka maunds they bring to the manufactory in the town, and it is so near to the river, that no less than half of it was washed away by the late flood.

As I find that it is necessary to go to Peshawur by Cohat, unless I proceed by the right bank of the river, I shall be in this district some ten or twelve days, as it is both an important and interesting geological one. By the district, I mean some 20 coss round. To-morrow I shall be in the immediate neighbourhood. On the 17th, I shall ascend the river in the boat, leaving every thing here, with the exception of a small tent, and shall be absent some six or seven days, depending much, however, on the geological structure of the country. I shall also have ample opportunity of witnessing the devastations of the late flood, the accounts of which given here are awful. I have made a magnificent collection of minerals at the different mines, and intend to send two camel loads for the boat to Bahawulpore, with directions to forward them to Ferozepore. I trust my collection of minerals, birds, &c. will surpass any that have been sent to Calcutta for some time. In addition to the two camel loads of minerals, I have other two camels and three mules loaded with

specimens, so that it is necessity which forces me to adopt the above plan, and here there are thousands of specimens which any collection in Europe would be proud to have. To shew the nature of the coal, I have enclosed specimens, which probably you will think worthy of being sent to the Coal Committee, Calcutta, in order that they may see that it is not true bituminous coal. The rocks illustrative of the district I shall afterwards furnish. I have made a small collection of coins; I send some that appear most interesting; probably you will transmit them to Secretary Torrens, for examination; their history, where found, &c. I shall afterwards send.

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*On the Literature and Origin of certain Hill Tribes in Sikkim. By A. CAMPBELL, Esq. Superintendent of Darjeeling.* <sup>6</sup>

Ilam Sing, Dewan of the Sikkim Raja, who is a Limboo, informs me, that the original country of his tribe is the province of Chung in Thibet, a short distance to the south of Lassa, and that the word "Chong," used by the Lepchas to designate this tribe, is a corruption of the provincial name. He also informs me that in his youth, fifty years ago, he used to see Limboos reading *pothis* in a character, which he believes was peculiar to his tribe, and that he was told by some of the patriarchs, that this character was one which had been compounded from many others, by a sage of the tribe, who had lived at a very remote unknown period. There are now no traces of the existence of a written character peculiar to the Limboos on this side of the snows, and as there is scarcely any intercourse between the southern members of the tribe and their northern progeners, and as those who essay writing in Nipal and Sikkim choose the Nagri character, it is probable that the language of the Limboos will not again be known as a written one on the southern side of the Himalaya.

Regarding the "Murmis," the same intelligent old gentleman tells me, that their Thibetan origin is well established, and known to all well-informed persons, who take an interest in tracing the peculiarities and affinities of the Cis and Trans-Himalayan tribes. Although I have mixed with many Murmis, I have not met with any who could give

me particulars of their Thibetan origin, all being satisfied with the knowledge of their tribe having at some remote period migrated across the snows from Bhote, and with asserting that they had preserved their language (Thibetan) and religion (Bhuddism) unchanged since their arrival. The Murmis are by the Lepchas and the Bhootiahs of Nipal and Sikkim, called "Nishung," which my informant says, arises from their being composed of two families, or divisions; one having migrated from the province of "Nimo" in Thibet, and the other from the district of "Shung" in the same country. Hence the general appellation "Nishung." The Dewan says, that the "Murmis" are a numerous tribe in their original country, through which he has passed *en route* from Sikkim to Lassa, by a road running parallel with the one from Digarchi to that city, but considerably to the eastward of it. He believes that the Murmis on this side of the snow are less changed in habits than any of the other Thibetan ones with which we are acquainted. Of the "Magars" he says, "They are unquestionably a people of this side of the snows, and the original country is Sikkim, from which they were first driven west by the Lepchas across the Mechi and Konki rivers, and thence further west by the Limboos beyond the Arun and Doodkooshi. While in Sikkim they were not Hindoos; they ate fowls, pigs, and everything except the cow, from which I believe they abstained. They had no priests, or *pūja* of any kind. Now, however, they have the Brahmins, and are, I believe, reckoned very good Hindoos in Nipal."

As to the "Gurungs," said the Dewan in reply to my questions anent them, "we people of Thibetan origin have nothing to do with them, they belong especially to the central and western parts of the Nipal mountains, and have always, I believe, been less or more followers of Hindooism." The locale of the Gurungs is correctly enough stated here; whether their Thibetan origin can be disproved I know not, but Mr. Hodgson probably can settle the question.

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*A FIFTH Memoir with reference to the Theory of the Law of Storms in India, being researches about the Madras Storm of May 16th, 1841, and an account of a Whirlwind experienced by the French Ship " Paquebot des Mers du Sud," Capt. P. Saliz, off the Cape. By HENRY PIDDINGTON, Esq.*

On the 16th May 1841, a storm was experienced at Madras, severe enough to cause all the ships to put to sea, and one or two vessels were lost along the coast, with several native craft. I am indebted to the very zealous exertions of Capt. Biden, Master Attendant of Madras, for almost all the logs from which I have been able to trace it; and it proves, like those I have hitherto investigated, to have been a true circular storm coming from the E. S. E. the centre passing over Madras, or a little to the northward. My own collection indeed amounts but to one of the logs, that of the *Petite Suzanne*, French ship, which however enables us to estimate the centre for the 15th.\*

As before, I give first the documents in the order in which I have used them, and then a statement of the various authorities for the centres marked for the track of the storm at noon each day.

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*Capt. Biden's Letter says,*

Madras, June 2nd, 1841.

" You will have heard of our gale on the 16th; it was partial, and did not blow very hard here; it seems that the vessels which slipped from the roads experienced more severe weather outside. All the 15th, the weather looked suspicious, cloudy, gloomy, and the atmosphere very close. On that evening I despatched a circular through the fleet, advising a good look-out, and due preparation in cases of emergency. The Barometer continued nearly stationary until noon on Sunday; when the surf rose, the breeze increased, and the Barometer fell. I made signals first to prepare, and in an hour afterwards to cut or slip. It blew fresh from N. N. E. at this time, 1 p. m. and at 4 p. m., there was much thunder and lightning with rain; at 7 the gale increased; and about 8, amid torrents of rain, and with a short lull, the gale flew round to the S. S. W.

\* I am also indebted to Government for the report from Captain Campbell, Assistant Surveyor General, which enables us to trace the storm in land to Royacottah and Bangalore.



blowing furiously for an hour ; at this time the report from the Observatory, stated ' we expect a perfect hurricane ; be prepared.' I was on the beach all night, and at 11 the Barometer had risen considerably ; the wind abated, and towards day-light we had a strong Southerly wind, with fair weather. You will have observed by the Madras papers, how materially the Barometers differed, but I think the best instrument we have here, is that kept by Lieut. Ludlow, which the scrap of a newspaper states, fell to 29·069. Several ships experienced quite a gale on the 3d of May close to the Line. There has been much bad weather all along the Coromandel Coast."

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*Madras Gale ; from the Newspaper account.*

" On Saturday evening the sun set with every appearance of rain. Accordingly, about seven P. M. the rain commenced, and continued, with but little intermission till early yesterday morning. Between five and eleven P. M. on Saturday, the wind, which had been gradually increasing in violence throughout the day, blew a strong gale, first from the North and then from the South, and for a few minutes, from all points of the compass. At ten A. M. the Master Attendant signalized the vessels in the roads to *slip and make sail*, which was seconded by guns fired from the ramparts ; in consequence of which, all the English vessels in the roads immediately put to sea. Their Commanders and Chief Officers were mostly on shore at the time, one of whom offered two hundred rupees for a boat to convey him on board, but without effect, as the sea was running too high for any boat to make the attempt. The *Catherine* was the last that left the roads. Soon after the gale commenced on Sunday evening, two Native Brigs and two Dhonies were driven on shore. One of the former was completely shattered to pieces. A third Dhoney foundered a short distance outside the surf, but the crew had fortunately got into a boat, and were picked up by another Dhoney. The greatest praise is due to the Master Attendant and his Assistant for the judgment, activity, and zeal, displayed by them prior to and during the gale, by which, in all probability, great loss of life was prevented.

" We have not heard of any damage having been done on shore, beyond the blowing down of a tree here and there, and the loss of a few tiles from off sundry old houses.

“ We have received several accounts of the effects of the gale, one of which we herewith append.

“ The gale commenced at about two o'clock on Sunday morning from the North Westward (was not this about the hour of moon rising?) attended with violent squalls and rain, which it was feared, would part the Shipping: however, at day-light, all appeared to be holding on well. At this time, the weather seemed broken, and the Barometer high and steady, though the surf was so high that no boats could go off. From nine till noon, the weather was murky, and unsettled. The Scud was flying, sometimes in a South and South Easterly direction, and so long as the wind hung off the land, no danger to the Shipping was apprehended. At one p. m. indications of bad weather became apparent by the falling of Barometers, and the Surf and Sea rising to an alarming degree, and merging into one, nearly a mile out. The Commanders of Vessels (nearly all of whom were on shore, with some of the Chief Officers) now felt very anxious for the safety of their vessels, especially when it was impossible for them to get off to their ships; which were signalized from the Master Attendant's Flag-staff to prepare for sea, and afterwards to cut or slip, simultaneous with which, guns were fired every *five* minutes for one hour from the Ramparts of the Fort, which latter excellent warning we do not recollect having been adopted for many a year. At this moment, the deepest anxiety was depicted in the countenance of every Commander whilst watching his vessel in the operation of cutting or slipping, which we understand was all done in the quickest and most seaman-like manner, and every vessel safely under-weigh endeavouring to make an offing by two o'clock. Until six p. m. the Barometers continued gradually falling, and the weather assumed a most threatening appearance. Every body who had the shipping interest at heart highly approved of the prompt and judicious steps taken by the Master Attendant, in advising the vessels to go to sea, and felt glad that they were all well outside and clear of the roads. Not so with the Dhonies, which, after observing that all the vessels had been warned and had proceeded to sea, remained, preferring trusting to their fragile ground tacking rather than venture to sea in such tempestuous weather. The consequence was, that two Brigs and one Dhoney came on shore at the Fort after dusk, and one Brig during the night at the Adyar. We also learn that one Dhoney

foundered in the roads, though the crew happily reached another Dhoney in a jolly boat. As far we can learn, we are glad to state, that no lives were lost throughout this catastrophe, though it was difficult to advise the poor creatures (fearful of their safety whilst clinging to the wrecks) not to attempt to leave their vessels until ordered, lest they might be carried under the vessels' bottoms and be crushed by the under-tow of the water; however, fortunately, Mr. McKennie succeeded in this respect.

"We are informed that the conduct of most of the Officers of H. M. 57th Regiment, with many others, namely Doctor Rogers, the Town Major, Captain Noble, Fort Adjutant, Mr. Maclean, the Captains whose vessels had gone to sea, Captain Phillips, Mr. Dallas, and many other gentlemen, was most praiseworthy, for their unwearied exertions and at some risk of their lives, (as it was, we understand, several persons were hurt by the pieces of the wreck, Captain Tapley of the Tenasserim being one) to rescue the poor unfortunate creatures from their perilous situation.

"At eight P. M., the weather moderated, and yesterday morning boats were able to go off to the Dhonies, which are now in the Roads, with the anchors and cables which were wanting. Of course the commanders are anxiously watching and waiting the return of their vessels, and the Master Attendant must have enough to do to recover the anchors and cables from which the shipping have parted and slipped. The wind being southerly, it was yesterday favourable for the vessels to run back again."—*Athenæum*.

From the *Madras Herald* of the 19th instant, we gather a few more items of news, but they are of no great moment:—

'Of the ships which put to sea on Sunday, the *Fartescue* only has returned to the roads. She has, we believe, sustained little or no damage. The *John William Dare*, Captain Shepherd, from Bombay the 24th of April, and Colombo the 11th of May, the *Helen Mary*, Captain Palmer, from Colombo the 10th of May, and the *Champion*, Captain Bentley, from Moulmein the 27th of April, came in yesterday. The first of these three vessels lost her top-masts on the 15th, in a heavy squall, but the second, though she encountered the same storm, sustained no injury. The *Champion* too is all right and tight.

*Extract from the Log of the French Ship, Petite Suzanne, Capt. GARDET,  
reduced to Civil Time.*

The French ship *Petite Suzanne* was at noon on the 14th May in lat. 10° 21' N., longitude by Chr. (from Paris) 81° 14' E. or 83° 34' E. from Greenwich, wind WNW. 5 knot breeze, which became variable and calm towards midnight with squalls.

15th. Midnight to noon, winds variable from North to NNW. in puffs, increasing to heavy squalls and rain, sea rising. No observation. Lat. by account 9° 25' N., longitude 81° 40' Paris, or 84° London. Noon hove to under close reefed main topsail. P.M. gale from N. to NNW. and NW.—at 5 to 8 NE. to East—at 9, South, and at 11 SSW. blowing a heavy gale. At 11 P.M. almost a hurricane, ship hove to again since 9 P.M. when she bore up for an hour.

16th. To noon wind SSW. At 6 A.M. gale moderating. At  $\frac{1}{2}$  past 7 bore up. Noon no observation, lat. account 10° 38' N., longitude account 84° 3' Paris, or 86° 23' London : to midnight winds SSW. and S. and fine.

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*The Hydroose.*

News from Madras received to-day mentions that the *Hydroose*. (Linton,) from Calcutta, bound to the Mauritius, had put into Coringa for repairs, having experienced much squally weather in her passage hence, in which she received much damage. On the 15th ultimo, when in lat. 12° 8' N. and long. 84° 47' E. the bad weather began ; and on the following morning it increased with heavy gales from E. to N. E., wind shifting to the Westward during the day, with a high sea on—they were then in lat. 11° 37' N. and long. 84° E.—the vessel labouring much. At this time she began leaking, and the pumps were kept constantly going ; the leak being in no way lessened, and all her sails having been split in a heavy gust, besides a portion (800 bags) of her cargo having been thrown overboard to lighten her, she was obliged to put into Coringa for repairs.—*Calcutta Courier*, June 11.

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*Master Attendant's Office, Madras.*

“*State of the Barometer, from the Surveyor's Observatory.*—In our notice of the storm which visited Madras on the 16th and 17th inst. in

our last issue, we were incorrect, we find, in assigning 29·31 only as the lowest range of the Barometer ; the mercury having stood at 29·069 at 6h. 56m. on the 16th. The following is a memorandum of the range during that day, corrected for temperature, &c., as noted at the Magnetic Observatory by Lieutenant LUDLOW :—

10½ A. M.	29·6505
11 „	·6205
12 Noon.	·5550
2 P. M.	·4625
4h. 41m.	·3190
5 41	·2710
6 41	·1227
6 56	·0690 the lowest, af-

ter which it began to rise.”—*Madras Spectator.*

*Ship George the Fourth's report to the Master Attendant of Madras.*

“ I beg to say, upon slipping last Sunday, we experienced a hard gale from Northward veering to Westward, with tremendous squalls which lasted till about 4 A. M. The following morning more moderate, and settling into fresh SW<sup>y</sup>. Monsoon with fine weather. According to your request, I have sent the indication of Simp. and Bar. together with Lat. and Long. each day at noon.”

Sunday, 16th.	Simp.	Bar.	17th.	Simp.	Bar.	19th.	Simp.	Bar.
2½ P.M.	29.56	29.34	4.00 P.M.	29.70	29.52	8.00 A. M.	29.90	29.70
4.00	„ 40	„ 23	8.00	„ 72	„ 54	Noon 19th,	„ 87	„ 69
6.00	„ 20	„ 5	4.00 A. M.	„ 74	„ 56	8.00 P.M.	„ 93	„ 76
8.00	„ 50	„ 14	8.00	„ 80	„ 62	8.00 A. M.	„ 96	„ 79
Midnight,	„ 60	„ 40	Noon 18th,	„ 80	„ 62	Noon 20th,	„ 92	„ 76
4.00 A. M.	„ 65	„ 46	4.00 P.M.	„ 80	„ 63	8.00 P. M.	„ 96	„ 79
6.00	„ 73	„ 50	8.00	„ 80	„ 64	Noon 21st,	„ 92	„ 73
Noon 17th,	„ 68	„ 52	4.00 A. M.	„ 80	„ 65	4 A. M.	„ 88	„ 73

	Monday	Tuesday	Wednesday	Thurs.	Friday	Saturday
Latitude, ..	13° 16' N.	13° 14' N.	12° 23' N.	11° 39' N.	11° 38' N.	12° 44' N.
Longitude, ..	81° 9' E.	82° 13' E.	83° 41' E.	83° 56' E.	83° 14' E.	80° 57' E.

*Ship City of Poonah's report.*

Sunday, 16th May, 1841.—At day light, fresh gale with rain, found the Barque *Ann* driving near to us ; at 10 A. M. veered away to 90 fathoms. Barque still driving. At 30 P.M. slipped our chain, and stood

out to sea under treble reefed topsails, fore topmast staysail and double reefed driver. At 4.30 p.m. a sudden shift of wind from SW. with thunder, lightning, and rain, blowing a complete hurricane; carried away larboard quarter boat, and driver boom, split main topsail and foresail. At 8 p.m. brought ship to under bare poles; after, moderated and made sail to the best advantage.

	17th May.	18th May.	19th May.
Latitude, . . . . .	13° 3' N.	13° 23' N.	13° 10' N.
Longitude, . . . . .	81° 22' E.	82° 06' E.	81° 54' E.

*Barque Tenasserim's report.*

*Saturday, 15th May, 1841.*—First part N. Westerly and NNW. breezes and a confused sea; midnight blowing hard, veered away chain to 65 fathoms.

*Sunday, 16th May.*—From midnight blowing hard with a heavy sea getting up, daylight blowing very hard from NNE. with heavy appearance and every indication of an approaching gale. About noon, agreeable to instructions per signal from the shore, let go the best bower. At 1 p.m. a very heavy sea struck the ship, carried away all the palls of the windlass and the starboard hawsepipe, and parted the larboard lower chain; finding ourselves in a very critical position with respect to the *George the Fourth*, Indiaman, thought it most prudent to run to sea. Set the foresail, fore-topmast staysail, and close reefed main topsail and trysail, running ESE. At 5 p.m. the gale suddenly abated, and veered round to the S. E., immediately wore ship to the SW., scarcely had we wore round than a tremendous squall from S.E. caught the ship and laid her on her beam ends for a quarter of an hour, split the foresail to ribbands and also the lee clew of the main topsail; whilst in this position the jolly boat was unhooked by the booms, and fell in the water bow foremost, carrying away the topping lifts and guys; was unable to recover her, whilst in this state, therefore cut away the stern falls. About 6h. 30m. a tremendous sea struck us on the larboard quarter, capsized and broke the companion hatch; put the chronometer for safety down below; tremendous hard squalls from the southward; running east under bare poles, the main trysail being split; observed, running apparently before the



wind, a Barque, which obliged us to keep away and shew a light; she passed within a quarter of a mile of us. At 8 p.m. lashed the helm "a lee," and set the fore topmast staysail; shipping immense quantities of water in every direction. Midnight blowing a hard gale from SSW. with a confused sea; during a severe squall, the jib accidentally got adrift unperceived by any one, and was unfortunately nearly all blown away; during the height of the gale the Barometer 28.60.

*Monday, 17th May.*—A. M. very hard squalls with a heavy sea, vessel labouring heavily (but perfectly tight), gale somewhat abated. About daylight noon, a fresh gale and cloudy weather, lat. observed  $13^{\circ} 16'$  N., long. by chron.  $81^{\circ} 29'$ —7h. 30m. very heavy, threatening appearance in SW. wore ship to the ESE. and furled the fore topsail; blowing a hard gale with a heavy confused sea, making breaches in every direction, a great quantity passed below, through the companion hatch, though every precaution was used, by nailing planks and double tarpaulins over it. Midnight Do weather—Barometer these 24 hours very unsettled; at midnight, 28.80.

*Tuesday, 18th May.*—Blowing a hard gale with a high rolling sea, causing the vessel to lurch very heavily; at 1, Barometer 29.00; at 2h, 30m, fell to 28.80; at 3 blowing very severe with a clear sky; 4 moderate; 5h. 30m. wore ship to the westward; daylight moderate and clear, out close reefs; 7, wore ship to the SE., out all reefs; noon, a fresh breeze from SW. with a decreasing sea; latitude observed  $13^{\circ} 16'$  N., longitude by chronometer  $82^{\circ} 18'$  E.

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*Barque Fortescue's report.*

*Saturday, 15th May, 1841.*—Strong breezes and clear weather, with a very heavy swell; latter part, strong gales and squally weather.

*Sunday, 16th May.*—Strong gales and squally, people employed preparing ship for sea. At 7 A. M. hauled the long boat and gig alongside in order to hoist them in, found it was impossible to hoist them in, on account of the sea running so high, the long boat swamped alongside, and was obliged to cut them away. Barometer at the lowest 28.78. P. M. strong gales and hard squalls, people employed preparing for sea. At 1 slipped the best bower anchor and 90 fathoms of cable, set fore-topsail, trysail, foresail and main trysail and mizen. At 6, the wind blew a complete hurricane, brought the ship to the wind under reefed

main trysail. At 10, wind more moderate. Midnight, strong gales and hard squalls.

17th May.—Gales and squally weather. Noon, wind more moderate, latitude by observation  $12^{\circ} 52'$  North.

17th May.—P. M. North, 5 P. M. NW. 9 P. M. SW. 11 P. M. SSW.

18th May.—P. M. S. by W. Midnight SW.

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*Barque Jane Blain's report.*

Saturday, 15th May, 1841.—Having received instructions from the Master Attendant at 7 P. M. to pay particular attention to Section 15 of the Port Regulations, immediately we braced the yards to the wind and furled the awnings. At 11 P. M. while the master with the watch was on deck, the cable parted at the 30 fathoms shackle, cut away the best bower and veered away to 50 fathoms. At day light made all preparation for sea.

Sunday, 16th May, 1841.—At 1 P. M. we received orders to cut or slip; and run for sea, wind NNE., we slipped our best bower and run according to orders in company with *George the Fourth* and *Fortescue*. At 4 P. M. increasing gale, split the topmast staysail and foresail all to pieces, stowed the remains, lying to under the main trysail. At 4 P. M. blowing a severe hurricane, the main trysail blew all to pieces. At 8 the wind at NW. At 10 P. M. WNW. lying to with a top-gallant studding sail in the mizen rigging, loud claps of thunder and vivid lightning all round the compass.

Monday, 17th May, 1841.—Commences with a severe gale, attended with very hard squalls and rain. At 1 A. M. the wind into the SW. At 2 A. M. South. At 4, wind SSW. Noon, hard squalls and heavy rain, *out all reefs*.

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“ We were concerned at hearing of the loss of that well-known country vessel the *Isadora*, which, whilst loading at Vizagapatam, was totally wrecked on the 18th instant; we subjoin an extract from a letter on the above subject.

“ The *Isadora* is a total wreck. Mr. Arbuthnot, the Collector, rendered us most essential service. He and Mr. Conway and several gen-

lemen attended at the wreck the whole of the first day, and a great part of yesterday, though it was raining and blowing dreadfully, and no sort of shelter. Mr. Arbuthnot got a guard of *two hundred* Sepoys to protect the property, and a party of *fifty* Europeans to save it. Almost the whole cargo was saved, and many of the ship's spars, stores, &c. &c.

"The Brig *Catherine*, which put to sea from the Madras Roads during the gale of the 16th, had reached Vizagapatam on the 20th, says the *Athenæum*, with the loss of her main mast, which it had been found necessary to cut away, in consequence of the vessel having been thrown completely on her beam ends by a sudden gust of wind; she also lost her long-boat, which was cut adrift in the same emergency, at which time an unfortunate lascar was also washed overboard, and perished. In other respects the vessel is uninjured, and the little cargo that she had on board has been landed in good condition.

*Extract from the Log of the Barque John William Dare, from Colombo towards Madras, reduced to Civil Time.*

*Saturday, 15th May, 1841.*—P.M. westerly wind, light breezes and cloudy, with a dark appearance to the westward; sunset moderate breezes and cloudy. At midnight strong breezes and dark cloudy weather. At 1, strong puffs of wind. At 4, wind from the west. At 7 A.M. was taken a-back in a severe squall from the Eastward, with lightning and heavy rain; before we could get the ship before the wind, the main topmast went; after that the fore topmast and mizen mast, flying jib boom, end of the jib-boom, spanker, gaff topsail, and all the rest of the sails more or less split in ten minutes, after which the wind veered round to the Westward. At 7h. 30m. Easterly winds; spoke the Barque *Helen Mary*, which supplied us with a fore trysail for a mizen. P. M. wind W. by N. commences with squally weather from the westward. At 3 P.M. a violent squall from the eastward, with heavy rain, finished clearing the wreck. Sunset, strong winds from N. E. and a dark gloomy appearance all round, reefed and set the foresail. At 8 P. M. blowing a gale of wind from the N.W. with constant heavy squalls of rain, a heavy sea getting up, ship labouring much, and shipping a quantity of water on deck.

*Sunday, 16th May.*—Midnight strong gales of wind with heavy rain at

intervals, ship straining and labouring very heavy, took in the foresail occasionally—Daylight ditto weather, with a high confused sea. Noon more moderate gale, decreasing weather, winds WSW. strong breezes, cloudy, with a heavy sea. Midnight, strong breezes and cloudy, lat. at noon  $11^{\circ}. 56' N.$

*Report from Captain Campbell, Assistant Surveyor General, Madras.*

I have the honor to report that the Barometers at Royacottah and Bangalore were affected by the Storm which took place at Madras at 2 A. M. of Sunday the 16th May 1841, and that at Royacottah the force of the gale was felt for some hours.

The observations at Royacottah were made by myself, with an open cistern instrument, on the plan described in the 29th No. of the Madras Journal, with a tube 3-10 inch in diameter, filled and boiled by myself.

The observations at Bangalore were made by the Rev. John Garrett, of the Wesleyan Mission, with one of Newman's iron cistern Barometers, with a tube filled and boiled by myself for the Medical Board at Madras, which on frequent comparison never differed the 1-100th part of an inch from my own.

The observations are reduced, except for temperature, as the variation from  $80^{\circ}$  of Fahrenheit by either instrument was but three or four degrees.

10 A.M.			4 P.M.		
Royacottah.	Bangalore.	Difference.	Royacotta.	Bangalore.	Difference.
12th, 27,113	27,148	·035	26,991	27,041	·050
13th, 27,055	27,126	·071	26,949	26,974	·025
14th, "	27,070	"	26,937	26,958	·021
15th, 27,023	27,056	·032	26,911	26,948	·037
16th, 26,963	26,972	·009	26,859	"	"
17th, 26,901	26,966	·055	26,843	26,888	·045
18th, 26,963	27,007	·044	26,863	26,923	·040
19th, 27,035	27,083	·048	26,959	26,984	·025
	27,113				
	26,901				
	0,212 Extreme Depression on 17th.				

Depression greatest at Royacottah by ·0·4 inch.

The very slight variations in the difference of the observations between the two instruments at a distance of forty miles, shews that the observations deserve the utmost confidence. The greatest depression observed was at Royacottah on the 17th, equal to 0·212 inch below the pressure on the 12th.

*Observations on the weather at Royacottah on the 16th, at 10 A. M.*

Wind N.W. overcast, with Nimbi. Thick in N.E.; lower stratum of clouds moving rapidly with a N.E. current; rain in N.E. and S. at a great distance (forty miles), air very clear. Four P.M. overcast; wind at N. drizzling and heavy rain. At night, about two in the morning, wind increasing to a gale, direction not certain, believed, S.E.; 17th, at sun rise wind quite fallen.

At Bangalore,

16th May.—10 A. M. wind moderate, very cloudy and oppressive. At day-light 5 A. M. Barometer 26·868, rain at night 17th; 10 A. M. very high wind, stormy; it is to be noted, however, that in this month high winds prevail at Bangalore.

It will be remarked that the gale was felt simultaneously at Royacottah and at Madras.

*Royacottah, 6th August, 1841.*

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The *Helen Mary*, in company with the *John William Dare*, had nearly the same weather, but her log affords no Lat. nor Long. from which to deduce her position.

The Barque *Champion* also from Moulmein to Madras, in Lat.  $10^{\circ} 1'$  N. to Lat.  $9^{\circ} 23'$  had tremendous gusts of wind from WNW. on the 16th, veering to the SW. which seem to have been the usual monsoon; but as there is no longitude with her log it is quite useless as an authority.

The Barque *Ayrshire* from Malacca to Madras has obliged us with a capital log, but she was fortunately for her, though unfortunately for us, in lat.  $6^{\circ} 30'$  N. and long.  $89^{\circ} 54'$  on the 15th. She had here a heavy SW. monsoon, varying from SbW. to SW.

The *Bengal Merchant* from Moulmein to Madras passed through Duncan's passage in the Andamans on the 15th with strong SEbS. breezes and clear weather, which would agree with the centre of that day if we suppose the storm to have extended so far, which I do not think it did.

The Barque *Catharine*, about midnight on 15th had a shift of wind in a gale from NE. to SW. and from that, to noon 16th, strong gales from SW. being then in  $8^{\circ} 27'$  N. and  $82^{\circ} 32'$  E. Her vicinity to the high land of Ceylon, and her being considerably to the Southward, with the SW. monsoon blowing strongly, makes her's also a very uncertain datum,

and certainly not to be compared to the exactness derived from that for the Madras ships and shift of wind on this day. I have however marked her position for the 16th and 17th on the chart.

The Barque *Amelia* from Vizagapatam to Madras had heavy gales varying from ENE. to NE. on the 16th in lat.  $14^{\circ} 51' N.$ ; no longitude, given; but she was not very far from the coast, and thus shows clearly enough that the storm extended to about the distance we have taken. As usual she had SE. winds on the following day.

We have two very good stations for this storm, from which we are enabled, I think, to fix its track and rate of travelling with tolerable accuracy. The first of them is on the 15th, when we have the French ship *Petite Suzanne's* log and that of the *Hydroose*, which give a centre at noon on that day about where I have placed it, or in lat.  $9^{\circ} 52' N.$  long.  $87^{\circ} 12' E.$  We have then Captain Biden's careful account giving the shift of wind at Madras at 8. P. M. on the 16th. Now from noon on the 15th to 8 P. M. on the 16th is 32 hours, and the distance is about 453 miles in that time, or 340 miles in the 24h. or  $14\frac{1}{6}$ th per hour. Taking eight hours of this rate, or 113 miles, backwards from Madras on the ESE. and WNW. line of its track, (it will be seen by Captain Biden's letter that at Madras this *was* its track the shift being from NNE. to SSW,) we have for noon of the 16th the spot I have marked, 113 miles ESE. of Madras; and as we find by the various logs of the vessels which slipped from Madras roads, that the shifts or veerings of the wind were between noon and 5 P. M., as they had necessarily run out towards it to get the best offing they could, we cannot be far wrong. This centre of the 16th agrees very remarkably with the log of the *Hydroose*, which vessel had her shift of wind on its track, and if our rate is correct, about 10 hours before noon, or at 2 A. M. of the 16th. It will also, with allowance for the drift (for her track was not the strait line it is laid on the chart) agree very well with the position of the *Petite Suzanne*, which vessel, by the rapid veering of the wind, must have had the centre not far from her at one time; and I attribute to this the anomaly of her having had the wind for about three hours from NE. to East. It will be borne in mind, in considering the two positions of this vessel, that there is good reason to suppose that in these storms strong partial marine currents may be at times created.\* We may also remark of her, that

\* Col. Reid, and various logs in my preceding Memoirs.

she is about as far from the centre at noon on the 16th as she was at noon of the 15th, and that the weather seems to have moderated on the former day to about the degree of violence at which it was on the latter, which is also an indirect testimony to the truth of our estimate of the places of the centres. These are tolerable good data for the centre of the 16th, and as the storm was then rapidly approaching the shore, it would as usual, in all probability, begin to show those anomalies which there seems no reason to doubt *do* occur when this is the case. It is most unfortunate that we have not, in the logs of the *J. W. Dare* and other vessels, any computed positions, even by dead reckoning, and not even a longitude! Nothing can more truly show the difficulty we meet with in procuring our information, than the fact, that in this instance, even the Master Attendant of the port could get only returns deficient in one of the most essential points!

I was at first inclined to supposed that the shift of wind experienced by the *Catharine* might have been that of another storm, which reaching Vizagapatam on the 18th was the cause of the loss of the *Isadora*, but the entire want of latitudes and longitudes, and even of the direction of the wind in the storm of the 18th at Vizagapatam, prevent our tracing this theory. Vizagapatam is however such a very unsafe anchorage for a vessel of any size in most weathers, that the *Isadora* may as probably have been wrecked by a strong Southerly gale as by a N. Easterly or Northerly one. I am inclined to suppose that it was merely a monsoon gale—i. e. the monsoon setting in with the force of a gale; which very frequently occurs.

I have before alluded to the rate of motion of this storm, which was apparently as high as  $14\frac{1}{2}$  per hour. I have made the vortex 310 miles in diameter, because I think that the logs of the *Hydroose* and *Petite Suzanne* fairly show them to be about on the outer verge of the storm at noon on the 15th, and from those of the *Amelia* and *Catherine* to the North and South, with the changes experienced by the *Hydroose* and *Petite Suzanne* to the East, and at Madras to the West, we cannot take it at less on the 16th.

Our only reports of its progress inland, where it would first meet with the lower ranges of the Eastern Ghauts forming the Pulicat Hills, about 60 miles inland from the coast, and successively with those which flank the table lands of Mysore, are those from the Assistant Surveyor General

at Royacottah, and from the Rev. Mr. Garrett at Bangalore, include his letter. The distance from Madras to Royacottah is about 160 W. by S.  $\frac{1}{2}$  S. and from Madras to Bangalore about 215 miles W.

We see that the centre passed Madras about 8 P.M. on the 16th taking it then to have a semi-diameter of about 150 miles, and it travelled in the same direction as before, it would have passed very considerably to the Northward of these two stations, and should have to be felt at Royacottah at 8 P. M. on the 16th; where, as we indeed the appearances and wind were suspicious, though unfortunately with no direction of it marked between 4 P. M. and 2 A. M. where it "believed" SE.; which would make the centre pass to the North. At Bangalore we have unfortunately no direction of the wind at the

The Barometrical table however, as compared with that of Madras of value, though it would have been far more so had any intermediate heights been observed from between 10 and 4, while the weather was so threatening. Taking the extreme Madras depression to have been at 7 P.M. of the 16th 29.0690, and that of Royacottah and Bangalore at 4 P.M. on the 17th, and that those epochs indicate the passage of the centre, we have then 21 hours for the time it took to travel from Madras to Royacottah, or 160 miles, which gives about 8 miles per hour as its rate of travelling when it reached the land, and had to fight its way over ridges of hills; while at sea it was, as we have seen, travelling at the rate of  $14\frac{1}{6}$  miles per hour, a very remarkable instance of the retardation which ridges of mountains (for Bangalore is at least 3000 feet above the sea, and the crests of some of the Eastern Ghauts thereabouts may be much less than 5000 feet) produce on the rate of motion of a storm from seaward.

It is worth while to compare this retardation from 14 miles to 8 miles per hour, or say one half, with what the Cuttack storm of 1840 (*Memoir\**) appears to have also experienced from the same cause, but the ranges of hills were perhaps not so high. This storm seems to have been checked from about 350 miles per day, its greatest rapidity, to about 175 miles, or about one half its velocity on its approach to the land.

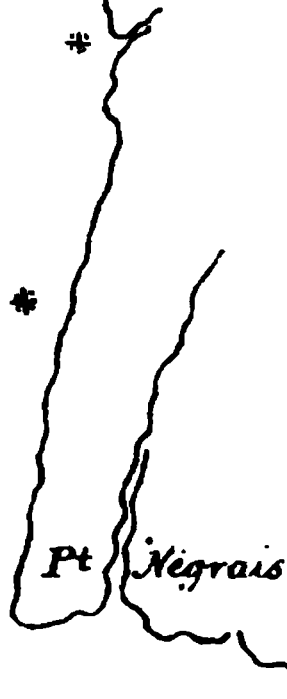
We do not know any thing of the Cuttack storm inland, but the Madras storm, which we are now considering, seems to have been

\* Journal Asiatic Society, vol. ix. p. 1009.



Chart  
to the Fifth Meridian  
on  
the LAW OF SEA  
In India  
shewing the probable  
of the Madras Strait  
16<sup>th</sup> May 18  
By H. Piddie

Dublin W. G. Lith.





broken up by the time it reached Royacottah and Bangalore, being described only as a gale at the first place, and of short duration, and as a "very high wind" at the latter; and as no damage done by it is mentioned, we may suppose it not to have been very severe? Its centre, if we suppose it to have had one at that time, and to have travelled on the same line, would have passed about 85 miles to the North of Royacottah, and about 50 miles to the North of Bangalore. When we reflect that there is a series of stations in this WNW. line from Madras across to Darwar on the Eastern side of the great chain of the Western Ghats, and to Rutnagherry on the Malabar Coast, it is not creditable to our brother sojourners in Southern India that not a single report has reached Government if the storm extended beyond Bangalore inland. One of the most curious points of research yet to be investigated is this of knowing where, and how, these great whirlwinds disperse; and we might here perhaps have had an instance of a storm being lifted upwards and re-descending when it had passed the barrier of the Ghats and table land. As things are, we must be content with what we have, and with having, through Captain Biden's zealous assistance, traced out this first of the Madras storms as clearly obeying the general law as to rotation and progression; and also as to what seems to be the usual track of those of the Bay of Bengal. I cannot conclude without earnestly requesting every person into whose hands this Memoir may fall to set down in a few lines the following data, in any storm which may occur, viz.

1. Situation of the observer before, during, and after the storm.
2. The direction of the winds as often as possible.
3. The times of varyings and shiftings of the wind.
4. The state of the Barometer, if any.
5. Any electric or other phenomena.
6. Any remarks and intelligence derived from other quarters.

All this may be done in a very few lines, and the report from it will not take more writing than a short letter. I presume that none are now ignorant of the very great importance of these researches, and at Madras the painful subject of my preceding Memoir, "*THE GOLCONDA'S STORM*," may have shewn most persons that, one day or other, they may possibly have a personal interest in the full investigation of the *THEORY OF STORMS*.

## PART II.

*The Whirlwind of the Paquebot des Mers du Sud, Captain P. SALIZ.*

The Mauritius Price Current of 7th and 14th September\* 1841, give the following notice of this remarkable phenomenon, and as it is most important to place a good account of it upon record, I have thought it right to print the Mauritius account, with the addition of what I have personally learnt from Captain Saliz.

“ Captain Saliz of the French Ship *Paquebot des Mers du Sud*, who arrived here on Wednesday last from Bordeaux, which port he left on the 9th June, reports, that on the 8th August, he encountered in latitude  $38^{\circ}$  south and longitude  $21^{\circ}$  east (from Paris.)  $23^{\circ} 20'$  E. from London ; while scudding before a tremendous sea, an awful whirlwind, which in a twinkling carried away her three sails furrowing them with flashes of light (without however either destruction or ignition,) carried away the two top-gallant masts, and shoved the ship to windward, throwing her on her beam ends to starboard, the water pouring over her bulwarks. In this perilous situation she lay for nearly half an hour, nor was she righted till she was again brought before the wind by means of a tarpaulin hung out from the fore rigging, and by cutting away the mizen mast, weather backstays, and shrouds of the main top mast, which fell, carrying along in its fall the head of the main mast. She scudded during the remainder of the gale under bare poles.”

In addition to this notice, Captain Saliz, who is a gentleman of education and long nautical experience, with great intelligence, has obligingly favoured me with his log book, and with replies to many questions addressed to him, from which I collect, in addition to what is stated above, the following particulars.

He was on the 8th August at noon in Lat.  $38^{\circ} 28'$  S. Long. by Chr.  $19^{\circ} 57'$  E. from Paris,  $22^{\circ} 17'$  E. from London Bar. at 27.5 French (28.00 Eng.) steering to the SE.  $\frac{1}{2}$  E. with wind from the North, to which it had veered from the NE. at midnight preceding. Sea heavy from NE. and at times from the NW. heavy squalls ; sea very high from

\* The P. C. of the 14th contains some corrections which are made here.

the NE. and North and going over the bulwarks. P. M. heavy gale from the Northward, scudding under double reefed main topsail on the cap, foresail and foretopmast stay sail: obliged to carry sail on account of the cross sea, ship rolling gunwales under. At 5 wind at NNW. to NW. At 6 caught by the whirlwind, as above related. Captain Saliz who was upon deck, says, that at the moment of being taken by it every thing was in a blaze of light (no lightning is marked before on the log, and he says that there was none worth noticing) like a sort of meteor, for there was fire every where, though nothing was burnt. The fire had no electrical characters. He distinctly saw the lightning cross the main\* topsail in zig-zags, when the sail disappeared. He says further that the whirlwind turned *from left to right outwards*. The vessel's head was about NE. while on her beam ends, and it was blowing so furiously, that it was impossible to look to windward. A very remarkable fact is, that while all around the horizon was a thick, dark, bank of clouds, the sky above was so perfectly clear that the stars were seen, and one star shone with such peculiar brilliancy above the head of the foremast that it was remarked by every one on board! The Barometer which, as stated, was at noon at 27.5 Fr. or 28.00 Eng. was at 6 P.M. at 27.3 Fr. 27.79 Eng., and at midnight again at 27.5 Fr. The gale after the whirlwind was at WNW. veering to the West, and remaining there till fine weather on the following day, when the American ship *Thomas Perkins* passed them with royals and studding sails set. A remarkable fact also was the warmth of the weather. Capt. Saliz did not notice the thermometer, but says that every one found it "quite warm!"

No person on board was in any way affected by the lightning. The sea after, and during, the vessel's lying over was much diminished, and was a sheet of foam. After righting she steered EbS. and ESE. with the wind.

They found, on saving the wreck of the main top mast and mainmast head, that the topmast, though the vessel was upon her beam ends, appeared to have been *lifted* out of its place instead of being wrenched over in any way! I should not omit to say here, for it is due to them, that Captain Saliz speaks in the highest terms of the spirit and courage shewn by his gallant little crew and officers in this perilous crisis.

\* Some fragments were left, but these had no traces of ignition

*Paragraphs to be added to Captain G. B. TREMENEER's Report on the Tin of Mergui, communicated to the Asiatic Society, through the Secretariat of the General Department.*

Of the existence of tin in considerable quantities there cannot, from the facts above stated, be much question ; and from the trial of the produce of one man's labour in a given time, there appears to be sufficient to justify every expectation of a profitable employment of labour on an extensive scale.

The results, however, which are given in detail, can only be considered rough approximations to the probable out-turn of tin, with an establishment properly superintended. Much economy in labour might be effected in collecting the sand and gravel for the washers, but no better mode could, I think, be adopted in separating the tin in the first instance, than by people accustomed to work with the flat conical-shaped troughs before described. The quantity collected would fully repay the employment of men in this operation.

The tin as produced by the washers, should be placed on sloping boards, and water conducted over it from a trough pierced with holes for the purpose, in order to get rid of foreign particles, and it would then, after by being finely pounded, be ready for smelting. Of all metals, tin is in this process the least troublesome after the ore is freed from the earthy and silicious particles, with which in other countries it is often mixed. The crystallized form in which the ore is here found, renders its separation extremely easy, and the whole processes of stamping and dressing, which in England are tedious and expensive operations, can thus be dispensed with. No arsenic or sulphur being mixed with the ore, it need not be roasted before it is placed in the furnace.

It will thus be seen, that the tin of the Mergui province offers no ordinary inducement to the outlay of capital without much of the risk, uncertainty, and large previous outlay usually attending mining adventures.

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*Extracts from a letter to Government on the above subject, from Dr.  
M'CLELLAND, Secretary to the Coal Committee.*

In reply I have the honor, under instructions of the Coal and Mineral Committee, to say, that the specimens of peroxide of tin received from the Tenasserim Provinces, are the usual ore of tin which is worked with much advantage in the Dutch possessions in the Straits, and in the lower parts of the Malay Peninsula, south of the British boundary ; but it has not hitherto been supposed to be sufficiently abundant on the Coast, to be profitably worked beyond the tenth degree of north latitude.

The importance of this ore depends entirely upon the quantity in which it occurs, the most profitable repositories are, those in which it is found in the form of crystals, in soft gneiss. It is often, however, profitably obtained from the sands of rivers, when it is called stream-tin ore.

The tin occurs as stream ore in all the localities described by Captain Tremenheere, except Kahun, a hill on the right bank of the great Tenasserim, about 11 miles from Mergui, vide paragraphs 16 and 17 of Captain Tremenheere's Report. Here Captain Tremenheere found the ore in its native repository, a friable gneiss rock, similar to that in which it occurs at Banca.

The Committee are of opinion, that the circumstances brought forward by Captain Tremenheere in the 16th and 17th paragraphs of his Report, are such as to render it desirable, that the miner recently employed in Kemaon, under Captain Drummond, should, if now available, be placed under the orders of Captain Tremenheere, for the purpose of ascertaining the value of the ore at Kahun.\*

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\* The miner (Mr. Wilkin) has, I am sorry to learn, preferred returning with the fruits of his experience in Kemaon to England to accepting this offer.—ED.

*Note to the Botanico-Agricultural Account of the protected Sikh States, No. 1, September, 1838, p. 764. By M. P. EDGEWORTH, Esq. C. S.*

The plant then described as *Reseda Oligandra*, has since been published in three plates to Jacquemont's Voyage, t. 25, p. 234, under the name of *Oligomeris Glauscescens*.

He forms a new genus of the *Resedaceæ* of it.

The species of the *Boragineæ* described, I have since ascertained to belong to the genus *Nonnea*, stated in Endlicher to belong to Europe and Central Asia.

The name of the species of *Plantago* is *Ban-phúla*, misprinted *Bau-phula*.

The species of the *Acanthaceæ* noted as peculiar to the Jhand tract, I have never had an opportunity of examining; the only time I ever saw it, was as a large leafless cone of imbricated bracts, containing ripe seeds, which were covered with silky hair; from its habit I should judge it to be either an *Acanthus* or a *Lepidagathis*.

I subsequently found Jacquemont's *Cleome Ruta*, t. 19, p. 19, apparently a very distinct species; it is very rare near Loodihana, but becomes abundant near Ferozpoor. This last locality is peculiarly distinguished by the abundance of the *Bertholetia lanceolata*, which covers acres of ground. I was only there during the winter, and had consequently no opportunity of investigating the botany of the neighbouring country. I observed great abundance of a species of *Womismia*, which I have not found to the east of Loodihana. It is nearly, if not quite, identical with Dr. Wight's *W. Capitata* from the Peninsula. But I doubt not that in the rainy season, several curious forms might be found in the neighbourhood of Ferozpoor, especially in the extensive Jhand forest lying to the south-east.

At Loodihana in August 1839, I detected a new species of grass, which I cannot refer to any described genus of *Chlorideæ*. It approaches nearest to *Eleusine*, but wants the great characteristic of that genus the *Aril*, and the spikelets are many-flowered. I propose to call it *Ochtlochloa*, from its growing only on Kheras, or Thés, the deserted sites of villages. *Οχθος tumulus*, *χλον grass*, generic character.



Spicæ digitatæ. Locustæ unilaterales sessiles, multifloræ distichæ; flore supremo sterili.

Glumæ 2. membranaceæ persistentis, angustæ, carinatæ inæquales.

Paleæ 2. exterior membranacea mucronata, interior hyalina mutica, lodiculæ hyalinæ ovatæ.

Stam 3. styli 2. stigmata plumosa, semen ellipticum, glabrum bimucronulatum.

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*OCHTHOCLOA dactyloides.*

*Descriptio.*

Repens, stolonibus longis ramosis nodisque glaberritis (rarius articulis pilis siricui albis circumdati) plus minus geniculatis; foliis approximatis angustis breviusculis vaginis brevibus, basi pilis longis sparsè barbatis, ligula brevi ciliato, membranacea.

Pedunculus erectus solitarius terminalis, spicis 3-5, stellatim digitatis, post anthesin defractis, multifloris; insertione pubescente, rachide undulato glabro asperulo.

Locusta biglumis, 7 floris cum octavo stirili.

Glumæ valde inæquales; *exteriore* paleis quadruplo brevior obtuse truncato, margine scariosa, uninervia carina viridi, serrulata; *superiore* paleis paulo brevior, multo angustior, uninervia, carina serrulata.

Paleæ 2: *exteriore* majore herbacea trinervia; purpurascens cum nervis viridibus nervo medio validiore serrulato; apice mucronulata basi hirtella: *superiore* subhyalina, carinis duabus eleganter ciliatis. Lodiculæ laterales, hyalinæ, ovatæ.

Stamina 3. longa exserta; antheris pallide purpuræ centibus utrinque breviter bifidis.

Ovarium turbinatum; stylis separatis breviusculis; stigmatibus breviter plumosis albidis exsertis.

Semen anguste ellipticum utrinque sub-acutum apice reliquiis stylo-  
rum bimucronulatum, rugosiusculum uno latere compressiusculum.

Habitat in Pagorum disertorum tumulis cum Capparide aphylla.

Apud pagum Jassowals prope Lodihana.

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*On Equations of Condition for a Quadrilateral, common or re-entrant. By Captain R. SHORTREDE, Assistant Surveyor General.*

Some years ago when engaged in investigating a general method for disposing fairly of the errors which occur in observing angles, the following properties of the angles of a quadrilateral occurred to me as furnishing equations of condition proper to be used in such cases. Some of the properties were new to me at the time, but it is possible enough, most of them may have been known long ago to others.

In the quadrilateral A B C D with its diagonals, for the sake of conciseness and uniformity, let  $A_1$  denote the angle B A C,  $A_2$  the angle C A D, and  $A_3$  the angle B A C; and similarly for the other angles, those on the left hand side having 1, as their distinctive mark; those on the right hand having 2, the whole angle of the figure being distinguished by 3.

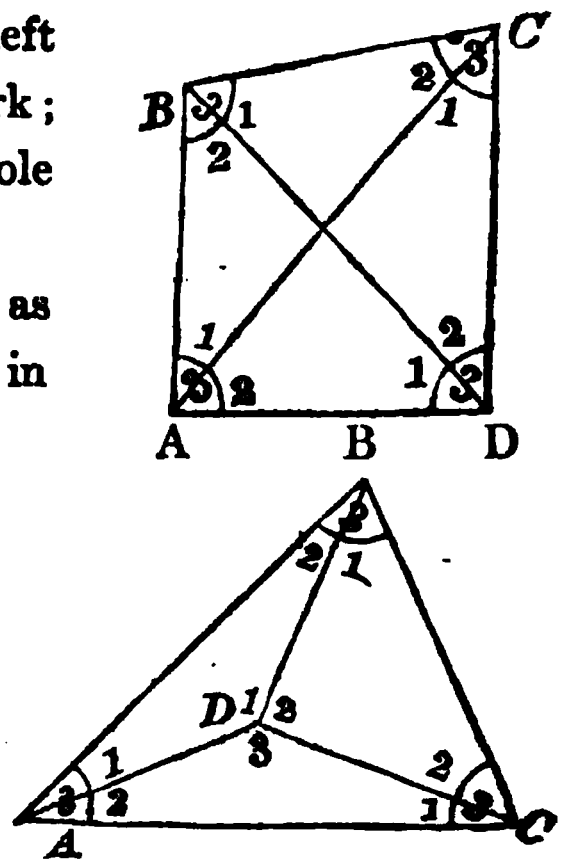
When the quadrilateral becomes re-entrant as in the 2d figure, a similar notation is used as in the margin.

There are two classes of these equations of condition, of which, one, depending entirely on the summation of the angles, may be termed the class of *angular* equations: the other depending on the products of the sines of the angles taken in a certain order may be termed *sinal\** equations.

In the first figure we have the following angular equation:—

$$(A) \quad \left. \begin{array}{l} A_1 + A_2 = A_3 \\ B_1 + B_2 = B_3 \\ C_1 + C_2 = C_3 \\ D_1 + D_2 = D_3 \end{array} \right\} \begin{array}{l} \text{These may be termed} \dagger \text{ Totopartial equations.} \\ \dagger \text{ These are not peculiar to figure or to space, but} \\ \text{are expressions for a universal property, common to} \\ \text{all sorts of quantity.} \end{array}$$

\* This word I prefer to Sinical, which, though formerly used, is now nearly obsolete: it has the advantage of being shorter, besides, not being liable to be mistaken for another word of similar sound, but of totally different meaning. Moreover the word sine being of apocryphal origin, we need not, for the sake of a fancied analogy, bind ourselves to the use of an inconvenient term.



$$(B) \left. \begin{aligned} A_1 + B_3 + C_2 - 180 &= \epsilon_1 \\ B_1 + C_3 + D_2 - 180 &= \epsilon_2 \\ C_1 + D_3 + A_2 - 180 &= \epsilon_3 \\ D_1 + A_3 + B_2 - 180 &= \epsilon_4 \end{aligned} \right\} \text{These may be termed Triangular equations.}$$

(C)  $A_3 + B_3 + C_3 + D_3 - 360 = \epsilon_1 + \epsilon_3 = \epsilon_2 + \epsilon_4$ . This may be termed the Quadrangular equation.

In the Triangular equations substitute for the middle angle its totopartial value as above, and subtract each expression from the one immediately above it, and we have

$$(D) \left. \begin{aligned} A_1 + B_2 - C_1 - D_2 &= \epsilon_1 - \epsilon_2 = \epsilon_4 - \epsilon_3 \\ B_1 + C_2 - D_1 - A_2 &= \epsilon_2 - \epsilon_3 = \epsilon_1 - \epsilon_4 \end{aligned} \right\} \text{These may be termed Vertical equations.}$$

In like manner in the 2d figure we have

$$(a) \left. \begin{aligned} A_1 + A_2 &= A_3 \\ B_1 + B_2 &= B_3 \\ C_1 + C_2 &= C_3 \\ D_1 + D_2 + D_3 &= 316 \end{aligned} \right\} \text{Totopartial equations.}$$

$$(b) \left. \begin{aligned} A_1 + B_2 + D_1 - 180 &= \epsilon_1 \\ B_1 + C_2 + D_2 - 180 &= \epsilon_2 \\ C_1 + A_2 + D_3 - 180 &= \epsilon_3 \\ A_3 + B_3 + C_3 - 180 &= \epsilon_1 + \epsilon_2 + \epsilon_3 \end{aligned} \right\} \text{Triangular equations.}$$

Also  $D_1 = 360 - D_2 - D_3$  and substituting the values of  $D_2$  and  $D_3$  from the triangular equations

$$\begin{aligned} &= 360 + B_1 + C_2 - 180 - \epsilon_2 + C_1 + A_2 - 180 - \epsilon_3 \\ &= B_1 + C_3 + A_2 - \epsilon_2 - \epsilon_3 \end{aligned}$$

$$(d) \left. \begin{aligned} \therefore B_1 + C_3 + A_2 - D_1 &= \epsilon_2 + \epsilon_3 \\ C_1 + A_3 + B_2 - D_2 &= \epsilon_3 + \epsilon_1 \\ A_1 + B_3 + C_2 - D_3 &= \epsilon_1 + \epsilon_2 \end{aligned} \right\} \text{These may be termed Cuneal equations, from the wedge shape of the angles concerned.}$$

If we examine in detail, these angular equations, we shall find that in both cases, besides the totopartial equations, there are two separate equations of condition, whereby to determine the error on each of the 12 angles in the figure. As these, with the exception perhaps of the Vertical and Cuneal equations contain nothing new, I shall proceed to the investigation of the sinal equations, which indeed is the main object of the present communication. These I shall give in the form, in which they first occurred to me.

Prop. I.—In a quadrilateral the product of the sine of any whole

angle, and the sines of the two consecutive left hand angles going round by the left, is equal to the product of the sine of the opposite whole angle, and the sines of the two corresponding right hand angles returning by the right.

$$(E) \quad \left. \begin{aligned} \sin A_3 \sin B_1 \sin C_1 &= \sin C_3 \sin B_2 \sin A_2 \\ \sin B_3 \sin C_1 \sin D_1 &= \sin D_3 \sin C_2 \sin B_2 \\ \sin C_3 \sin D_1 \sin A_1 &= \sin A_3 \sin D_2 \sin C_2 \\ \sin D_3 \sin A_1 \sin B_1 &= \sin B_3 \sin A_2 \sin D_2 \end{aligned} \right\} \begin{array}{l} \text{These (for rea-} \\ \text{sons afterwards} \\ \text{to be shewn) may} \\ \text{be termed exter-} \end{array}$$

nal alternate equations.

Prop. II.—In a quadrilateral, the continued product of the sines of two adjacent whole angles, and the sines of the angles between the diagonals, and the opposite sides, is equal to the continued product of the two pairs of opposite angles.

$$(F) \quad \left. \begin{aligned} \sin A_3 \sin B_3 \sin C_1 \sin D_2 &= \sin C_3 \sin D_3 \sin A_1 \sin B_2 \\ \sin B_3 \sin C_3 \sin D_1 \sin A_2 &= \sin D_3 \sin A_3 \sin B_1 \sin C_2 \end{aligned} \right\}$$

These may be termed opposite alternate equations.

Also the known property, that the product of the sines of all the left hand angles is equal to that of the sines of all the right hand angles.

(G)  $\sin A_1 \sin B_1 \sin C_1 \sin D_1 = \sin A_2 \sin B_2 \sin C_2 \sin D_2$  which may be termed the internal alternate equation.

#### Demonstration.

$$B D = C D \frac{\sin C_3}{\sin B_1} \text{ by common Trigonometry,}$$

$$\text{also } A D = C D \frac{\sin C_1}{\sin A_2} = B D \frac{\sin B_2}{\sin A_3} = C D \frac{\sin C_3 \cdot \sin B_2}{\sin B_1 \sin A_3}$$

$$\frac{\sin C_1}{\sin A_2} = \frac{\sin C_3 \cdot \sin B_2}{\sin B_1 \sin A_3}$$

$$\therefore \sin A_3 \sin B_1 \sin C_1 = \sin C_3 \sin B_2 \sin A_2 \dots \dots \dots (e)$$

$$\text{Again } B D = A D \frac{\sin A_3}{\sin B_2} = B C \frac{\sin C_3}{\sin D_2}$$

$$A C = B C \frac{\sin B_3}{\sin A_1} = A D \frac{\sin D_3}{\sin C_1}$$

$$\text{and multiplying vertieally, } \frac{\sin A_3 \cdot \sin B_3}{\sin B_2 \sin A_1} = \frac{\sin C_3 \cdot \sin D_3}{\sin D_2 \sin C_1}$$

$$\therefore \sin A_3 \cdot \sin B_3 \cdot \sin C_1 \cdot \sin D_2 = \sin C_3 \cdot \sin D_3 \cdot \sin A_1 \sin B_2 \quad (f)$$

This result might have been deduced from (E), by dividing any of the equations by another *as they stand*: thus:—

$$\frac{\sin B_3 \cdot \sin C_1 \cdot \sin D_1}{\sin C_3 \cdot \sin D_1 \cdot \sin A_1} = \frac{\sin D_3 \cdot \sin C_3 \cdot \sin B_2}{\sin A_3 \cdot \sin D_2 \cdot \sin C_2} \text{ and rejecting common factors.}$$

$$\frac{\sin B_3 \sin C_1}{\sin C_3 \sin A_1} = \frac{\sin D_3 \sin B_2}{\sin A_3 \sin D_2}$$

$$\therefore \sin A_3 \cdot \sin B_3 \cdot \sin C_1 \cdot \sin D_2 = \sin C_3 \cdot \sin D_3 \cdot \sin A_1 \cdot \sin B_2$$

Again multiplying vertically all the equations, (E) rejecting common factors, and taking the square root, we have

$$\sin A_1 \cdot \sin B_1 \cdot \sin C_1 \cdot \sin D_1 = \sin A_2 \cdot \sin B_2 \cdot \sin C_2 \cdot \sin D_2 \text{ ..(g)}$$

In like manner in the 2d figure we have the following equations:

$$\begin{aligned} \sin A_3 \cdot \sin B_1 \cdot \sin D_3 &= \sin B_3 \cdot \sin A_2 \cdot \sin D_2 \\ \text{(H)} \quad \sin B_3 \cdot \sin C_1 \cdot \sin D_1 &= \sin C_3 \cdot \sin B_2 \cdot \sin D_3 \\ \sin C_3 \cdot \sin A_1 \cdot \sin D_2 &= \sin A_3 \cdot \sin C_2 \cdot \sin D_1 \end{aligned} \left. \begin{array}{l} \text{Which may} \\ \text{be termed} \\ \text{external al-} \\ \text{ternate.} \end{array} \right\}$$

Also

$$\begin{aligned} \sin A_3 \cdot \sin B_1 \cdot \sin C_1 \cdot \sin D_1 &= \sin C_3 \cdot \sin B_2 \cdot \sin A_2 \cdot \sin D_2 \\ \text{(I)} \quad \sin B_3 \cdot \sin C_1 \cdot \sin A_1 \cdot \sin D_2 &= \sin A_3 \cdot \sin C_2 \cdot \sin B_2 \cdot \sin D_3 \\ \sin C_3 \cdot \sin A_1 \cdot \sin B_1 \cdot \sin D_3 &= \sin B_3 \cdot \sin A_2 \cdot \sin C_2 \cdot \sin D_1 \end{aligned}$$

which may be termed medial alternate.

And

(K)  $\sin A_1 \cdot \sin B_1 \cdot \sin C_1 = \sin A_2 \cdot \sin B_2 \cdot \sin C_2$  which may be termed internal alternate.

#### *Demonstration.*

$$CD = AC \frac{\sin A_2}{\sin D_3}$$

$$BC = AC \frac{\sin A_3}{\sin B_3} = CD \frac{\sin D_2}{\sin \sin B_1} AC \frac{\sin A_2}{\sin D_2} \cdot \frac{\sin D_3}{\sin B_1}$$

$$\frac{\sin A_3}{\sin B_3} = \frac{\sin A_2}{\sin D_3} = \frac{\sin D_2}{\sin B_1}$$

$$\therefore \sin A_3 \sin B_1 \sin D_3 = \sin B_3 \sin A_2 \sin D_2 \dots\dots\dots (h)$$

Multiplying vertically pairs of (H), and rejecting common factors, we have the equations,..... (i)

and multiplying vertically the whole of (H) in like manner, we have the equation,..... (k)

I found at first some difficulty in trying to express in a convenient form of words, the properties in the equations (H) and (I); but after

some consideration it appeared that they were included in the expressions for (E) and (F): for if the point D in fig. 1. be conceived to move along the line B D till it comes within the line A C, the quadrilateral with its diagonals is transformed into the triangle with its radial lines. The figure may now be considered as a quadrilateral with a reentrant angle, in which case the angles  $A_1$  and  $A_3$  exchange their designations,  $A_2$  remaining unchanged.

The analogy of these figures may be otherwise apprehended by considering them as the perspective representations of a tetrahedron; which is a quadrilateral with its diagonals, when the apex is projected between the exterior angles of the base; and is a triangle with its radial lines, when the apex is projected within the base, or within the vertical angles formed by the sides of the base produced.

These equations hold good in spherical as well as in plain figures, the only change in the demonstration being to substitute the sines of the spherical sides for the plane's sides as above.

The equations marked (G) and (K) are obviously only particular cases of a more general property given by W. Davies in his Supplement to the spherical part of Young's Trigonometry, and there said to be due to Professor Lowry. Lowry's Theorem is this: "*If great circles be drawn from the angular points of any spherical polygon to a point on the surface of the sphere, the product of the sines of the alternate angles will be equal.*" This theorem applies of course in plane as well as in spherical polygons, and it is not unlikely, that if we substitute lines of shortest distance (including at once both straight lines and great circles), it may be found to apply on a spheroidal, as well as on a spherical or a plane surface.

On farther consideration I find that the equations (E) and (H) are also included in Lowry's theorem. In fig. 1. D being the point to which lines of shortest distance are drawn from the angles of the polygon A B C Lowry's theorem gives at once the first of the equations (E) and taking successively the points A B and C in like manner, the other equations are evolved.

Likewise on fig. 2 if C be the point to which the lines are drawn from the angles of the polygon A B D, we have the first of the equations (H) and the others by taking successively A and B as the point of drawing to (i. e. *attraction* in its primary sense).

The sinal equations furnish in each case four equations of condition for

each of the 12 angles concerned. I do not see how any of them can fairly be omitted: for although any one of them may involve all the others *when the angles are free from error*, such is not necessarily the case when the angles, *as happens in fact*, are mixed up with errors we know not how. I know not of any way by which a fair judgment can be formed as to the goodness or badness of observations, besides that resulting from the amount of minimum alteration required to make the whole consistent among themselves. It is quite possible, and will generally happen, that in every one of the above equations taken singly, the errors will be so mixed up in two or more of the quantities concerned as in a greater or less degree to destroy the effect of each, which errors will become sufficiently apparent when the quantities are otherwise combined. Using the whole of the equations, if the correction for any one quantity retains the same signs throughout, while on another quantity the correction is in a great measure destroyed, being sometimes + and sometimes —, we may fairly infer that in the former case the observed quantity is erroneous, and in the latter that it approaches to its true value; the errors being in proportion to the algebraic sum of all the corrections.

The sines and angular equations of figure being quite independent of each other, I am not aware of any reason for preferring the one set of them to the other; it appears to me that both ought to be taken into account simultaneously, giving equal weight to the mean error as found from each set. By any other method, the ultimate corrections will depend on the arbitrary order, in which the equations may have been applied. It may, however, be expedient to apply the topographical equations, which are independent of figure, after having taken the mean of the others.

The practical use of these equations in the method above sketched, when we retain only what is necessary, though still somewhat long, is by no means very difficult. The most convenient way would be to take the sums of the effective probabilities, and the sums of the errors, and get the correction by common Rule of Three, by the help of a sliding rule.

Writers on the doctrine of probabilities direct that when several independent quantities occur, they should be combined according to their weights, or inversely as their probabilities of error, as found by the common rule. This applied to each of the above equations would give rise

to very lengthy calculations. But though the common rule for finding the probability of error on a number of observations be as good as, or perhaps better than, any other at present known, I think it may be shewn that after all it has only a chance of being right, and is far from certainty in all cases. It may be a pretty good approximation when the number of observations is great, but when the number is small it seems somewhat dubious ; at least, when the number is a minimum it is palpably false, and it is not likely that it should become false *per saltum*.

The rule commonly given, is to take the arithmetical mean of all the observations, and the difference between this and each observation ; then squaring each of these differences, take the square root of their sum ; which root divided by the number of observations gives the probability of error ; the reciprocal of which gives the proportional weight due to each.

I have long sought, but never met with, a demonstration of this rule. According to it, however great be the number of observations, if they differ among themselves by any quantity, however small, there will be a probability, however small, of error ; and therefore the result must fall short of certainty. But if there be any number of observations agreeing among themselves, or even only one observation, there is no probability of error : so at least says the rule, whereas common sense says in the latter case the probability of error is very great, though we have no means of making a better of it.

Hence I hold that the rule commonly given for finding the probability of error on a set of observations, though in general a pretty good practical rule, is *not a mathematical truth* : and I would not, on the faith of its being such, build a cumbrous computation to obtain a result not much, if at all better than that which may be obtained with one-tenth part of the labor : for such I believe would be the disproportion between the combination of these equations according to the method above indicated, and that by their weights as directed by writers on probabilities.

As to the practical difference in the results by these two methods of adjustment, I cannot speak from actual trial ; but I believe it would rarely exceed one or two hundredths of a second ; and if we recollect that it is amazingly difficult with ordinary, or even with extraordinary instruments, to observe to within ten times the greatest of these quan-



tities; and also that making adjustments by the sinal equations by means of Tables as in the final calculations to seven places of decimals, the difference of a single unit in the last place of a logarithmic sine corresponds at  $45^\circ$  to an angular difference of  $\frac{1}{21}$ , " or about five hundredths of a second; and at  $60^\circ$  to  $\frac{1}{14}$ , or about eight hundredths of a second; moreover, it is well known that in adding together several logarithms each of which is only approximately true in the last place, there can be no certainty that the sum will be true within one or two units in the last place; therefore the difference between the two methods of adjustment, (if I do not greatly err in estimating it,) may be considered as of no practical importance, being beyond the reach of the Tables.

In regard to the exceedingly minute quantities which some of the continental observers used to profess themselves able to determine by means of the repeating circle, there is a very sensible remark by old Troughton, in a paper of the Astronomical Society, the substance of which I quote from memory, to the effect that whatever be the ability of the observer, or the construction of his instrument, he never would believe in the quantities deduced beyond such as were visible in the telescope. In fact, so long as observations have error at all, dispose of that error how we may, we cannot get rid of it so as to ensure certainty; the only advantage which the arrangement ultimately adopted can possess is, that of being a little better than a number of other arrangements equally possible, each of which is only somewhat less probable.

N. B.—In the equations (B) (C) ( $\beta$ ) ( $\delta$ ) the characters  $\epsilon_1, \epsilon_2, \epsilon_3, \epsilon_4$ , denote the excess on the respective triangles.

### SPHEROIDAL EXCESS.

*To find an expression for the Excess on a Spheroidal Triangle. By Captain SHORTEDE, 1st Assistant Grand Trigonometrical Survey.*

It has been usual to consider the excess on a spheroidal as not differing sensibly from that on a spherical triangle of the same area as estimated by the mean radius of the earth, and this may generally be considered sufficient, for in the largest triangle ever observed, the

difference is not a matter of observation. But as the two triangles have not absolutely the same excess, it may be worth while to ascertain the precise value of each, and thereby what would be the difference in any particular case.

A solution may be obtained by means of the following principle given by Mr. Airey as resulting from Dalby's investigation, namely, that the excess on a spheroidal is the same as on a spherical triangle whose angular points have the same geographical latitudes and longitudes.

The arcs being small, (as is always the case in practice), it is an assumption generally made and admitted, that the computations may be made by means of the radii of curvature at their middle points, which comes to the same thing as to reckon longitudes by a normal equal to the mean of all the normals at the middle points of the three sides, and latitudes by a radius of curvature equal to the mean of the meridional radii of curvature at the same points : or simply or at once, by the normal and meridional radius of curvature at the centre of gravity\* of the triangle. The surface of the spheroidal triangle would coincide with that on a sphere if the differences of latitude were stretched out in the ratio of the meridional radius to the normal, or if the longitudinal differences were contracted in the inverse ratio. Hence the area, and also the excess on a spheroidal triangle would coincide with those on a sphere, if they be computed by a radius equal to a mean proportional between the normal and meridional radius (*i. e.* the greatest and least radii of curvature), at the middle of the triangle. This method (which is probably the simplest possible), is true as far at least as quantities of the 4th order, and in the present as well as prospective state of the arts and sciences, any thing farther may be thought an unnecessary refinement.

If  $r$  denote the radius of the sphere, and  $A$  the area of a spherical triangle, the expression for the excess  $E$  reduced to its simplest form is

$$E = \frac{A}{r^2} \text{ in terms of radius unity, or in seconds } E'' = \frac{A}{r^2 \sin 1''}, \text{ and}$$

if the area be assumed as equal to that of a plane triangle having the same sides  $a$ ,  $b$ , and contained angle  $C$ , the formula becomes

\* This expression may be objected to, as strictly the centre of gravity falls within the surface. It may be understood as an abbreviated expression, denoting the point of intersection of lines drawn from the angular points to bisect the opposite sides.

$E'' = \frac{a b \sin C}{2 r^2 \sin 1''}$ ; in which the denominator being constant, and the quantities in the numerator those which occur in the calculation of the triangle, the calculation of the excess becomes as simple as need be.

To adapt this to the case of a spheroidal triangle, all that is necessary is to substitute for  $r^2$  the expressions for the normal and meridional radius of curvature. Assuming  $a$  and  $\beta$  to denote the polar and equatorial radii, and  $\epsilon = \frac{\beta^2 - a^2}{a^2}$ , and  $\lambda$  the latitude, the expression for

the normal is  $\nu = \frac{a (1 + \epsilon^2)}{(1 + \epsilon^2 \cos^2 \lambda)^{\frac{1}{2}}}$ , and for the meridional radius

$\gamma = \frac{a (1 + \epsilon^2)}{(1 + \epsilon^2 \cos^2 \lambda)^{\frac{3}{2}}}$ ; hence the product of the two  $\gamma \nu = \frac{a^2 (1 + \epsilon^2)^2}{1 + \epsilon^2 \cos^2 \lambda}$

and this substituted for  $r^2$  gives the excess on a spheroidal triangle.

$$\begin{aligned} E'' &= \frac{a b \sin C}{2 a^2 \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{(1 + \epsilon^2)^2} = \frac{a b \sin C}{2 \beta^2 \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{1 + \epsilon^2} \\ &= \frac{a b \sin C}{2 a \beta \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{(1 + \epsilon^2)^{\frac{3}{2}}} = \frac{a b \sin C}{2 a \beta \sin 1''} \frac{1 + 2 \epsilon^2 \cos^2 \lambda}{1 + \frac{3}{2} \epsilon^2} \end{aligned}$$

Of the above expressions, the first three are identical and rigorous. The last is an approximation got by actually performing the operations indicated in that preceding it. It is however, sufficiently close for any ordinary purpose, as the quantities omitted affect only the 7th place of decimals. It appears from it that, when  $2 \cos^2 \lambda = \frac{3}{2}$ , or  $\cos^2 \lambda = \frac{3}{4}$ , that is, in latitude  $30^\circ$ , the excess on the spheroidal triangle coincides with that computed by the mean radius. In lower latitudes the spheroidal excess is greater than the spherical, and only in latitudes higher than  $30$  is it less than on the sphere.

To render this formula practically useful I have computed in the following Table the value of the logarithm of  $\frac{1}{2} \frac{1}{\gamma \nu \sin 1''}$  or  $\frac{R''}{2 \gamma \nu}$  for every degree of latitude. I have assumed the values of the polar and equatorial radii of the earth as deduced from the comparison of the whole European with the Indian arc, as far as Kahanpur in latitude  $24^\circ 07'$ , adapted to a ratio of axes 299 to 300.

SPHEROIDAL EXCESS.

Latitudinal Factors for computing Spheroidal Excess.

Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.	Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.	Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.
0	0.37505	1	30	0.37360	8	60	0.37071	8
1	504	0	31	352	9	61	063	9
2	504	1	32	343	9	62	054	8
3	503	1	33	334	10	63	046	8
4	502	2	34	324	9	64	038	8
5	0.37500	2	35	0.37315	10	65	0.37030	8
6	498	2	36	305	9	66	022	7
7	496	3	37	296	10	67	015	7
8	493	3	38	286	10	68	008	7
9	490	3	39	276	10	69	001	7
10	0.37487	3	40	0.37266	10	70	0.36994	6
11	484	4	41	256	10	71	988	6
12	480	5	42	246	10	72	982	6
13	475	4	43	236	10	73	976	5
14	471	5	44	226	10	74	971	6
15	0.37466	5	45	0.37216	10	75	0.36965	5
16	461	6	46	206	10	76	960	4
17	455	5	47	196	10	77	956	4
18	450	6	48	186	10	78	952	4
19	444	7	49	176	10	79	948	4
20	0.37437	6	50	0.37166	10	80	0.36944	3
21	431	7	51	156	10	81	941	3
22	424	7	52	146	10	82	938	3
23	417	8	53	136	9	83	935	2
24	409	7	54	127	10	84	933	2
25	0.37402	8	55	0.37117	9	85	0.36931	2
26	394	8	56	108	10	86	929	1
27	386	8	57	098	9	87	928	1
28	378	9	58	089	9	88	927	0
29	369	9	59	080	9	89	927	0
30	0.37360		60	0.37071		90	0.36927	

As an example, suppose it were required to find the excess on a triangle having its middle point in latitude 24°, the sides *a* and *b* being 40 and 50 miles, and the contained angle *C* = 65°, the logarithms of *a* and *b* in feet being 5.3246939 and 5.5007852, the calculation would stand thus :—

Tab Long for 24°,	...	...	...	...	0.37409
Long. Sin <i>C</i> = 65°,	...	...	...	...	9.55728
Long. <i>a</i> ,	...	...	...	...	5.32469
Long. <i>b</i> ,	...	...	...	...	5.50079
Long. <i>E</i> = 5."7128,					0.75685

It is of no great importance to know the latitude of the middle of the triangle much within a degree, because the difference of the tabular logarithms for a degree never exceeds unit in the 4th place, which will scarcely ever give any sensible difference on the resulting excess.

It will hereafter be shewn, that the error arising from assuming the area as equal to that of a plane triangle having the same sides and contained angle, is utterly insensible.

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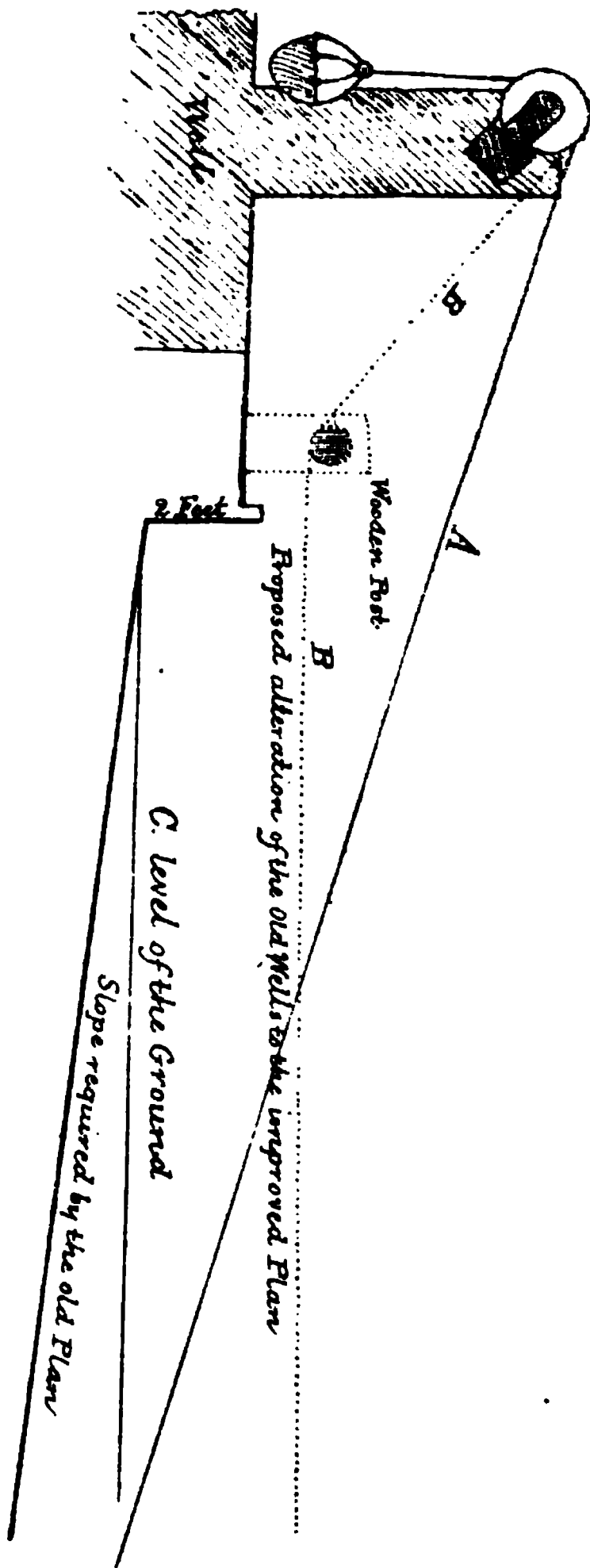
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It in Irrigation

*An improvement in Irrigation. By Lieut. A. MURRAY MCGREGOR,  
66th Regiment Native Infantry.*

My principle is, that the greatest power is obtained by keeping the line of draught horizontal, and at the height of the animal's shoulder as is shewn by the mode in which the gigs used in trotting matches are built. This plan was tried at Cawnpore, by Mr. Stubbs, provisioner, and he assured me, that he drew one-third more water by my method, than he had upon the old principle; and that the cattle were less distressed than by the old mode, as it is more laborious to walk up an ascent than upon level ground; and he had three more wells prepared upon my principle, as it was by far less expensive, and the ground formerly lost by the inclined plane was saved to the garden, by adapting the hose, (which I do not claim as my invention.) One man will do all the work, and a pair of bullocks will draw the water required in two-thirds of the time required formerly; and the expence is much less. The rope passes over the block or wheel A, and under that at B, by which great power is obtained.

By the common plan in use the excavate ground becomes at once a dead loss, and the labour of walking up the inclined plane is very great, as it is required to be very steep. I have therefore, by the dotted line B, shewn how the alteration of the present system can be made. It will be requisite, however, to fill up the slope of the inclined plane to the level of the ground as marked at C, but that can easily be done: it would not cost more than three or four rupees.

N. B.—On the old principle, the driver is obliged to sit on the rope, to keep the yoke on the bullock's necks.

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*The accompanying are two very compendious Logarithmic Tables, in which I have endeavoured to combine the minimum of size, with the maximum of utility.—By Capt. SHORTREDE.*

The mode of using these Tables is so similar to that of the Tables in common use, that it is almost needless to give any particular directions on the subject.

It is to be understood that every number in the body of each Table is supposed to consist of 5 figures; the single figure on the left in columns 0 and 5 being common to the succeeding columns on the same and following lines. These leading figures increase progressively by unity, and nine changes occur in each Table. To mark this change, when it occurs any where not at the beginning of a line, the numbers subsequent to the change are put a little lower than their usual place, in order to indicate that their first figure is to be supplied from that on the lower line, besides which, the first following zero is printed black to distinguish it as a change figure.

The Table of common Logarithms (neglecting at present those beyond 1000) has in its first column marked Nat. Num. the natural numbers from 10 to 100, and immediately adjoining in the column headed 0 are the corresponding Logarithms, (for numbers between 1 and 10, the Logarithms are opposite the tenfold number): for numbers for three figures the two first being found in the first column, the 3rd is to be found among those at the top, and in the body of the Table is seen the corresponding Logarithm. For numbers of more than 3 figures the Logarithm is found by adding to that in the Table the proportional part for the 4th and subsequent figures, (allowing, *if need be*, for the difference between the proportional part in that and the next line according to the distance of the 3rd and following figures from the middle of the line.)

*Example.*

Required the Log. of 33952.	
for 339 the Table gives, ..	53020
for 5 Propl. part gives; . . . .	65
for 2 Propl. part gives, . . . . .	2·6
	<hr/>
Log. Required, 53087·6	

The 3d and subsequent figures of 33952 being about midway between 3345 and 3445, the proportional parts should be the half of those given in lines 33 and 34. Instead of 65, the proportional



The inverse use is not so convenient.  
Given Log. 53087 Reqd.Num.  
Tab.Log.next less 53020 N.N.339

67

Prl.pt.(corrd.) next less 64 . . . . . 5

3

2.6 . . . . . 2

Number Reqd. 33952

part should be 64, being the mean of 65 and 63 : which would agree better with the result given by the larger Tables.

The Antilogarithmic Table contains the numbers to a series of Logarithms from 0 to 999. The first column contains the two first figures of the Logarithm, the third being found at the top of the columns; and in the body of the Table is found the corresponding natural number. When the Logarithm consists of more than 3 figures, the proportional part for the 4th and subsequent figures, taken in the same line, are to be added to the number given in the body of the Table.

[The proportional parts being given for the mean difference at the middle of the line, may be adjusted, if need be, to their proper value, by allowing at sight for the difference between their value in that and the next line, according to the distance of the 3rd and following figures from 45 the middle of the line.]

Example.

Required the Number to Log. 71572.  
For Log. 715 the Table gives, 60954  
for 7 Propl. part is . . . . 98  
for 2 Propl. part is . . . . 2.8

61054.8

Here the 3rd and subsequent figures being close to the middle of the line need no correction.

Inversely Required the Logarithm to Number 61055.

Given Number 61055

Table Number next less . . 60954

Difference 101

For difference next less. . . . . 98

3.

For difference next less. . . . . 2.8

The Logarithm is . . . . . 715

Proportional part is . . . . . 7

Proportional part is . . . . . 2

Log. Required, 71572

Lalande's tables to 10,000 occupy no less than 110 pages, 18mo. and part of the 111th page. Mr. Bailey has given, in his astronomical tables, a table of Logarithms to 1000 contained on 3 pages, 4to. but only to 4 places of decimals; and subsequently he has given, as being more convenient for ordinary use, an Antilogarithmic table, of the same size and extent as the former, and besides these I am not aware of any smaller hitherto published.\*

Having occasion some years ago to lay off the divisions on some sliding rules, I felt it was desirable to have at one view a table of Logarithms to 1000, that I might avoid the inconvenience of turning leaves with a beam compass in hand: I therefore wrote out the body of the first table nearly in its present form. It was immediately evident that if furnished with differences and proportional parts, the table would serve for most common purposes: accordingly the difference between the numbers in columns 4 and 5 having been written, the decimal parts were got by means of a sliding rule, with no more labour than writing them off.

The extension of the table beyond 1000 was partly to fill up the blank space, and also to avoid partly the inconvenience of the unequal differences at the beginning of the table. I found, however, that as it stood, even when the differences were most unequal, by attending to the *actual* difference between the columns, and allowing a proportional part for the difference between that and the difference here given, (and still more easily by allowing at sight for the difference between the proportional part on that and the next line according to the distance from the middle of the line,) I could get a result true, generally, within one, and always within two units in the last figure; and the same more conveniently by taking the proportional part of the actual difference by means of a sliding rule, which when engaged in calculation, I like to have always within reach.

The second table was made for the purpose of finding the number to a given Logarithm more readily than can be done by the other table. It has also the advantage of having more equal common differences. The utility of it for all ordinary purposes has been experienced by others besides myself.

\* Dr. Maclear, for the use of the Cape Observatory, has remodelled Mr. Bailey's 2d Table, and printed it on two foolscap pages, with proportional parts, in a form not unlike that here given.

Each table may be made to do all that can be done by the other, but not with equal convenience. The first table giving at sight the logarithm to a number of 3 figures, and the second giving at sight the number to a logarithm of 3 figures, the proportional parts for the 4th, and subsequent figures are additive : but if a number to a given logarithm be sought by means of the first table, or if the logarithm to a given number be sought by means of the second, one subtraction is required for each figure in the proportional part : and subtraction, though a simple operation, is by no means so short or so easy as addition, and hence the advantage of using both tables instead of either exclusively.

Great care has been taken to make these tables correct in every case to the nearest unit in the last figure. The first table was taken from Lalande, whose tables are known to be correct, and has been rigidly compared in every figure. The second table was made by means of the common table in Callet, and after having been written out, it was examined by reading out the number to every logarithm, using Babbage's tables. When it was uncertain in this way whether the number was more or less than 5 in the 6th place, it has been determined by a calculation carried to ten figures.

For finding the common differences and proportional parts the following method was used. Having determined to give these for the middle between columns 4 and 5 of each table, those for the first table were thus found.  $M$  denoting as usual the common modulus, and  $N$  the number in the first column of the Table, the common difference has been taken by the formula  $\frac{M}{M + 4.5}$  ; and the proportional parts by its decimal products, taking care to make each true to the nearest unit in the 5th place of decimals.

For the second table the principal was the same, but the process vastly simpler. By the common differential formula  $d \log N = \frac{M d N}{N}$  ; (the same as that used above) ; from this we have  $d N = N \cdot \frac{d \log N}{M}$  : in which  $M$  and  $d \log N$  being constant, the only variable is  $N$ , and by the nature of the Table  $\log N$  in each successive line increases by unit in its 2nd figure. Hence the logarithm of  $d N$  being calculated for any one line, it is found for each succeeding line by adding one to its 2nd digit, and the common difference, or the number corresponding to this calculated logarithm being found more or less nearly in some column in

the body of the table, the successive differences will be found in the corresponding part of the same vertical columns throughout the table. The *proportional parts* are found exactly in the same way; and thus, for finding the whole of the common differences and proportional parts, only ten calculations are needed; the remaining labour being merely to transcribe from the columns in the body of the table, taking care to keep the numbers always true in the last figure.

The whole of the differences and proportional parts, after being written in, have been carefully re-examined, and I hope it will be found that these precautions have not been misapplied, so as to have failed as to the object intended.

These tables are of the minimum size, at least I do not see the possibility of making them any smaller without rendering them useless. Lalande "after 50 years' experience," at page 6, of the preface to his Tables, makes the following remarks on the advantage of smallness:—

"La plupart des calculs n'exigent que les minutes: les astronomes, les navigateurs, les militaires, les géographes, les arpenteurs, les architectes, ont un besoin continuel de petites tables, bien plus rarement des grandes. Si l'on cherche les minutes dans un gros volume qui contient les secondes, on perd du tems. Le format de celui-ci n'exige rigoureusement que le tems nécessaire à l'opération: d'ailleurs les vues basses ont de la peine avec les grandes tables; enfin plus le volume est mince, plus il est commode à l'usage ordinaire. Ainsi j'ai réduit celui-ci au pur nécessaire."

## Common Logarithms of Natural Numbers.

## Proportional Parts.

Natural Number.	0	1	2	3	4	5	6	7	8	9
10	00000	0432	0860	1284	1708	2111	2531	2938	3342	3743
11	4139	4532	4922	5311	5690	6070	6445	6819	7188	7555
12	7916	8279	8636	8991	9342	9691	10037	10380	10721	11059
13	11394	11727	12057	12385	12710	13033	13354	13672	13988	14301
14	4613	4922	5229	5534	5836	6137	6435	6732	7026	7319
15	7609	7898	8184	8469	8752	9033	9312	9590	9866	10140
16	20412	0653	0852	1219	1481	21748	2011	2272	2521	2768
17	3045	3200	3353	3505	3655	3804	3951	4097	4242	4385
18	5527	5768	6007	6245	6482	6717	6951	7184	7416	7647
19	7875	8103	8330	8556	8780	9003	9226	9447	9667	9885
20	30108	0320	0535	0750	0965	31175	1387	1597	1806	2015
21	2222	2429	2634	2838	3041	3244	3445	3646	3846	4044
22	4242	4439	4635	4830	5025	5218	5411	5603	5793	5984
23	5172	5361	5549	5736	5922	6107	6291	6473	6654	6834
24	8021	8202	8382	8561	8739	8917	9094	9270	9445	9621
25	9794	9957	0140	0311	0483	0654	0824	0993	1162	1330
26	41497	1664	1830	1996	2160	2325	2488	2651	2813	2975
27	3126	3287	3457	3616	3775	3933	4091	4248	4404	4560
28	4718	4871	5025	5179	5331	5484	5637	5788	5939	6090
29	6240	6389	6538	6687	6835	6982	7129	7276	7422	7567
30	47712	7757	8001	8144	8287	8430	8571	8714	8855	8996
31	9136	9276	9415	9554	9693	9831	9969	1006	0243	0379
32	50515	0651	0786	0920	1055	1189	1322	1455	1587	1720
33	1851	1983	2114	2244	2375	2504	2633	2762	2892	3020
34	3148	3275	3403	3529	3656	3782	3908	4033	4158	4283
35	54407	4531	4654	4777	4900	5023	5145	5267	5388	5509
36	5630	5751	5871	5991	6110	6229	6348	6467	6585	6703
37	6820	6937	7054	7171	7287	7403	7519	7634	7749	7864
38	7976	8092	8206	8320	8433	8546	8659	8771	8883	8995
39	9106	9218	9329	9439	9550	9660	9770	9879	9988	1007
40	60206	0314	0423	0531	0638	60746	0853	0959	1066	1172
41	1278	1384	1490	1595	1700	1805	1909	2014	2119	2221
42	2325	2428	2531	2634	2737	2839	2941	3043	3144	3246
43	3347	3448	3548	3649	3749	3849	3949	4048	4147	4246
44	4345	4444	4542	4640	4738	4836	4933	5031	5128	5225
45	5321	5418	5514	5610	5706	5801	5896	5992	6087	6181
46	6276	6370	6464	6558	6652	6745	6839	6932	7025	7117
47	7210	7302	7394	7486	7578	7669	7761	7852	7943	8034
48	8124	8215	8305	8395	8485	8574	8664	8753	8842	8931
49	9020	9108	9197	9285	9373	9461	9548	9636	9723	9810
50	9897	9984	0070	0157	0243	70329	0415	0501	0586	0672
51	70757	0842	0927	1012	1096	1181	1265	1349	1433	1517
52	1600	1684	1767	1850	1933	2016	2099	2181	2263	2346
53	2428	2509	2591	2673	2754	2835	2916	2997	3078	3159
54	3239	3320	3400	3480	3560	3640	3719	3799	3878	3957
55	74036	4115	4194	4273	4351	74429	4507	4586	4663	4741
56	4819	4896	4974	5051	5128	5205	5282	5358	5435	5511
57	5587	5664	5740	5815	5891	5967	6042	6118	6193	6268
58	6343	6416	6492	6567	6641	6716	6790	6864	6938	7012
59	7086	7159	7232	7305	7378	7452	7525	7597	7670	7743

	1	2	3	4	5	6	7	8	9	10
106	308	349	391	333	374					
107	190	228	265	303	341					
108	174	209	244	279	314					
109	161	194	226	259	291					
110	150	180	210	240	270					
112	141	169	197	225	253					
106	132	158	185	211	238					
100	124	149	174	199	224					
94	118	141	165	188	212					
89	112	134	156	179	201					
86	108	127	149	170	191					
81	101	121	142	162	182					
77	97	117	135	155	174					
74	93	111	130	148	167					
71	89	107	124	142	160					
68	85	102	119	137	154					
66	82	99	115	131	148					
63	79	95	111	127	143					
61	76	92	107	122	137					
59	74	88	103	118	133					
57	71	86	100	114	128					
55	69	83	97	110	124					
54	67	80	94	107	120					
52	65	77	91	104	117					
50	63	76	88	101	114					
48	61	74	86	98	110					
46	60	71	83	95	107					
45	58	70	81	93	104					
44	56	68	79	90	102					
43	55	66	77	88	99					
42	54	64	75	86	96					
41	52	62	73	84	94					
40	51	61	72	83	93					
39	50	60	70	80	90					
38	49	59	68	78	88					
37	48	57	67	76	86					
36	47	56	65	75	84					
35	46	55	64	73	83					
34	45	54	63	72	81					
33	44	53	62	71	80					
32	43	52	61	70	79					
31	42	51	60	69	78					
30	41	50	59	68	77					
29	40	49	58	67	76					
28	39	48	57	66	75					
27	38	47	56	65	74					
26	37	46	55	64	73					
25	36	45	54	63	72					
24	35	44	53	62	71					
23	34	43	52	61	70					
22	33	42	51	60	69					
21	32	41	50	59	68					
20	31	40	49	58	67					
19	30	39	48	57	66					
18	29	38	47	56	65					
17	28	37	46	55	64					
16	27	36	45	54	63					
15	26	35	44	53	62					
14	25	34	43	52	61					
13	24	33	42	51	60					
12	23	32	41	50	59					
11	22	31	40	49	58					
10	21	30	39	48	57					

Natural Number.	Common Logarithms of Natural Numbers.										Common Difference	Proportional Parts.									
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
60	77815	7887	7960	8032	8104	78176	8217	8319	8390	8462	72	7	14	22	29	36	43	50	57	65	
61	8533	8604	8675	8746	8817	8888	8958	9029	9099	9169	71	7	14	21	28	35	42	49	57	64	
62	9239	9309	9379	9449	9518	9588	9657	9727	9796	9865	70	7	14	21	28	35	42	49	56	63	
63	9934	0003	0072	0140	0209	80277	0316	0414	0482	0550	68	7	14	21	27	34	41	48	55	62	
64	80618	0686	0754	0821	0889	0956	1023	1090	1158	1224	67	7	13	20	27	34	40	47	54	61	
65	1291	1355	1425	1491	1558	81624	1690	1757	1823	1889	66	7	13	20	27	33	40	46	53	60	
66	1954	2020	2086	2151	2217	2282	2347	2413	2478	2543	65	7	13	20	26	33	39	46	52	59	
67	2807	2672	2737	2802	2866	2930	2995	3059	3123	3187	64	6	13	19	26	32	39	45	51	58	
68	3251	3315	3378	3442	3506	3569	3632	3696	3759	3822	63	6	13	19	25	32	38	44	51	57	
69	3885	3948	4011	4073	4136	4198	4261	4323	4386	4448	63	6	13	19	25	31	38	44	50	56	
70	84510	4572	4634	4696	4757	84819	4880	4942	5003	5065	62	6	12	18	25	31	37	43	49	55	
71	5126	5187	5248	5309	5370	5431	5491	5552	5612	5673	61	6	12	18	24	30	36	42	48	54	
72	5733	5794	5854	5914	5974	6034	6094	6153	6213	6273	60	6	12	18	24	30	36	42	48	54	
73	6332	6392	6451	6510	6570	6629	6688	6747	6806	6864	59	6	12	18	24	30	35	41	47	53	
74	6923	6982	7040	7099	7157	7216	7274	7332	7390	7448	58	6	12	18	23	29	35	41	47	53	
75	87506	7564	7622	7679	7737	87795	7852	7910	7967	8024	58	6	11	17	23	29	35	40	46	52	
76	8031	8138	8195	8252	8309	8366	8423	8480	8536	8593	57	6	11	17	23	28	34	40	45	51	
77	8649	8705	8762	8818	8874	8930	8986	9042	9098	9154	56	6	11	17	22	28	34	39	45	50	
78	9209	9265	9321	9376	9432	9487	9542	9597	9653	9708	56	6	11	17	22	28	33	39	44	50	
79	9763	9818	9873	9927	9982	90037	0091	0146	0200	0255	55	5	11	16	22	27	33	38	44	49	
80	90309	0333	0417	0472	0526	0580	0634	0687	0741	0795	54	5	11	16	22	27	32	38	43	49	
81	0849	0902	0956	1009	1062	1116	1169	1222	1275	1328	53	5	11	16	21	27	32	37	43	48	
82	1381	1434	1487	1540	1593	1645	1698	1751	1803	1855	53	5	11	16	21	26	32	37	42	47	
83	1908	1960	2012	2065	2117	2169	2221	2273	2324	2376	52	5	10	16	21	26	31	36	42	47	
84	2428	2480	2531	2583	2634	2686	2737	2788	2840	2891	51	5	10	15	21	26	31	36	41	46	
85	92942	2993	3044	3095	3146	93197	3247	3298	3349	3399	51	5	10	15	20	25	30	36	41	46	
86	3450	3500	3551	3601	3651	3702	3752	3802	3852	3902	50	5	10	15	20	25	30	35	40	45	
87	3952	4002	4052	4101	4151	4201	4250	4300	4349	4399	50	5	10	15	20	25	30	35	40	45	
88	4448	4498	4547	4596	4645	4694	4743	4792	4841	4890	49	5	10	15	20	25	29	34	39	44	
89	4939	4988	5036	5085	5134	5182	5231	5279	5328	5376	49	5	10	15	19	24	29	34	39	44	
90	95424	5472	5521	5569	5617	95665	5713	5761	5809	5856	48	5	10	14	19	24	29	34	38	43	
91	5904	5952	5999	6047	6095	6142	6190	6237	6284	6332	47	5	9	14	19	24	28	33	38	43	
92	6379	6426	6473	6520	6567	6614	6661	6708	6755	6802	47	5	9	14	19	23	28	33	38	43	
93	6848	6895	6942	6988	7035	7081	7128	7174	7220	7267	46	5	9	14	19	23	28	33	37	42	
94	7313	7359	7405	7451	7497	7543	7589	7635	7681	7727	46	5	9	14	18	23	28	32	37	41	
95	97772	7818	7864	7909	7955	98000	8046	8091	8137	8182	45	5	9	14	18	23	27	32	36	41	
96	8227	8272	8318	8363	8408	8453	8498	8543	8588	8632	45	5	9	14	18	23	27	32	36	41	
97	8677	8722	8767	8811	8856	8900	8945	8989	9034	9078	45	4	9	13	18	22	27	31	35	40	
98	9123	9167	9211	9255	9300	9344	9388	9432	9476	9520	44	4	9	13	18	22	26	31	35	40	
99	9564	9607	9651	9695	9739	9782	9826	9870	9913	9957	44	4	9	13	17	22	26	30	35	39	
100	00000	0043	0087	0130	0173	00217	0260	0303	0346	0389	43	4	9	13	17	22	26	30	35	39	
101	0432	0475	0518	0561	0604	0647	0689	0732	0775	0817	43	4	9	13	17	21	26	30	34	38	
102	0660	0903	0945	0988	1030	1072	1115	1157	1199	1242	42	4	8	13	17	21	25	30	34	38	
103	1284	1326	1368	1410	1452	1494	1536	1578	1620	1662	42	4	8	13	17	21	25	29	34	38	
104	1703	1745	1787	1828	1870	1912	1953	1995	2036	2078	42	4	8	12	17	21	25	29	33	37	
105	02119	2160	2202	2243	2284	02325	2366	2407	2449	2490	41	4	8	12	16	21	25	29	33	37	
106	2531	2572	2612	2653	2694	2735	2776	2816	2857	2898	41	4	8	12	16	20	24	29	33	37	
107	2938	2979	3019	3050	3100	3141	3181	3222	3262	3302	40	4	8	12	16	20	24	28	32	36	
108	3342	3383	3423	3463	3503	3543	3583	3623	3663	3703	40	4	8	12	16	20	24	28	32	36	
109	3743	3782	3822	3862	3902	3941	3981	4021	4060	4100	40	4	8	12	16	20	24	28	32	36	

Antilogarithmic Cases, being Natural Numbers to Common Logarithms.										Proportional Parts.										
Common Logarithm.	0	1	2	3	4	5	6	7	8	9	Common Difference.	1	2	3	4	5	6	7	8	9
0	1000	1005	1010	1015	1020	1025	1030	1035	1040	1045	5	1	2	3	4	5	6	7	8	9
1	1050	1055	1060	1065	1070	1075	1080	1085	1090	1095	5	1	2	3	4	5	6	7	8	9
2	1100	1105	1110	1115	1120	1125	1130	1135	1140	1145	5	1	2	3	4	5	6	7	8	9
3	1150	1155	1160	1165	1170	1175	1180	1185	1190	1195	5	1	2	3	4	5	6	7	8	9
4	1200	1205	1210	1215	1220	1225	1230	1235	1240	1245	5	1	2	3	4	5	6	7	8	9
5	1250	1255	1260	1265	1270	1275	1280	1285	1290	1295	5	1	2	3	4	5	6	7	8	9
6	1300	1305	1310	1315	1320	1325	1330	1335	1340	1345	5	1	2	3	4	5	6	7	8	9
7	1350	1355	1360	1365	1370	1375	1380	1385	1390	1395	5	1	2	3	4	5	6	7	8	9
8	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	5	1	2	3	4	5	6	7	8	9
9	1450	1455	1460	1465	1470	1475	1480	1485	1490	1495	5	1	2	3	4	5	6	7	8	9
10	1500	1505	1510	1515	1520	1525	1530	1535	1540	1545	5	1	2	3	4	5	6	7	8	9
11	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	5	1	2	3	4	5	6	7	8	9
12	1600	1605	1610	1615	1620	1625	1630	1635	1640	1645	5	1	2	3	4	5	6	7	8	9
13	1650	1655	1660	1665	1670	1675	1680	1685	1690	1695	5	1	2	3	4	5	6	7	8	9
14	1700	1705	1710	1715	1720	1725	1730	1735	1740	1745	5	1	2	3	4	5	6	7	8	9
15	1750	1755	1760	1765	1770	1775	1780	1785	1790	1795	5	1	2	3	4	5	6	7	8	9
16	1800	1805	1810	1815	1820	1825	1830	1835	1840	1845	5	1	2	3	4	5	6	7	8	9
17	1850	1855	1860	1865	1870	1875	1880	1885	1890	1895	5	1	2	3	4	5	6	7	8	9
18	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	5	1	2	3	4	5	6	7	8	9
19	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	5	1	2	3	4	5	6	7	8	9
20	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	5	1	2	3	4	5	6	7	8	9
21	2050	2055	2060	2065	2070	2075	2080	2085	2090	2095	5	1	2	3	4	5	6	7	8	9
22	2100	2105	2110	2115	2120	2125	2130	2135	2140	2145	5	1	2	3	4	5	6	7	8	9
23	2150	2155	2160	2165	2170	2175	2180	2185	2190	2195	5	1	2	3	4	5	6	7	8	9
24	2200	2205	2210	2215	2220	2225	2230	2235	2240	2245	5	1	2	3	4	5	6	7	8	9
25	2250	2255	2260	2265	2270	2275	2280	2285	2290	2295	5	1	2	3	4	5	6	7	8	9
26	2300	2305	2310	2315	2320	2325	2330	2335	2340	2345	5	1	2	3	4	5	6	7	8	9
27	2350	2355	2360	2365	2370	2375	2380	2385	2390	2395	5	1	2	3	4	5	6	7	8	9
28	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445	5	1	2	3	4	5	6	7	8	9
29	2450	2455	2460	2465	2470	2475	2480	2485	2490	2495	5	1	2	3	4	5	6	7	8	9
30	2500	2505	2510	2515	2520	2525	2530	2535	2540	2545	5	1	2	3	4	5	6	7	8	9
31	2550	2555	2560	2565	2570	2575	2580	2585	2590	2595	5	1	2	3	4	5	6	7	8	9
32	2600	2605	2610	2615	2620	2625	2630	2635	2640	2645	5	1	2	3	4	5	6	7	8	9
33	2650	2655	2660	2665	2670	2675	2680	2685	2690	2695	5	1	2	3	4	5	6	7	8	9
34	2700	2705	2710	2715	2720	2725	2730	2735	2740	2745	5	1	2	3	4	5	6	7	8	9
35	2750	2755	2760	2765	2770	2775	2780	2785	2790	2795	5	1	2	3	4	5	6	7	8	9
36	2800	2805	2810	2815	2820	2825	2830	2835	2840	2845	5	1	2	3	4	5	6	7	8	9
37	2850	2855	2860	2865	2870	2875	2880	2885	2890	2895	5	1	2	3	4	5	6	7	8	9
38	2900	2905	2910	2915	2920	2925	2930	2935	2940	2945	5	1	2	3	4	5	6	7	8	9
39	2950	2955	2960	2965	2970	2975	2980	2985	2990	2995	5	1	2	3	4	5	6	7	8	9
40	3000	3005	3010	3015	3020	3025	3030	3035	3040	3045	5	1	2	3	4	5	6	7	8	9
41	3050	3055	3060	3065	3070	3075	3080	3085	3090	3095	5	1	2	3	4	5	6	7	8	9
42	3100	3105	3110	3115	3120	3125	3130	3135	3140	3145	5	1	2	3	4	5	6	7	8	9
43	3150	3155	3160	3165	3170	3175	3180	3185	3190	3195	5	1	2	3	4	5	6	7	8	9
44	3200	3205	3210	3215	3220	3225	3230	3235	3240	3245	5	1	2	3	4	5	6	7	8	9
45	3250	3255	3260	3265	3270	3275	3280	3285	3290	3295	5	1	2	3	4	5	6	7	8	9
46	3300	3305	3310	3315	3320	3325	3330	3335	3340	3345	5	1	2	3	4	5	6	7	8	9
47	3350	3355	3360	3365	3370	3375	3380	3385	3390	3395	5	1	2	3	4	5	6	7	8	9
48	3400	3405	3410	3415	3420	3425	3430	3435	3440	3445	5	1	2	3	4	5	6	7	8	9
49	3450	3455	3460	3465	3470	3475	3480	3485	3490	3495	5	1	2	3	4	5	6	7	8	9
50	3500	3505	3510	3515	3520	3525	3530	3535	3540	3545	5	1	2	3	4	5	6	7	8	9
51	3550	3555	3560	3565	3570	3575	3580	3585	3590	3595	5	1	2	3	4	5	6	7	8	9
52	3600	3605	3610	3615	3620	3625	3630	3635	3640	3645	5	1	2	3	4	5	6	7	8	9
53	3650	3655	3660	3665	3670	3675	3680	3685	3690	3695	5	1	2	3	4	5	6	7	8	9
54	3700	3705	3710	3715	3720	3725	3730	3735	3740	3745	5	1	2	3	4	5	6	7	8	9
55	3750	3755	3760	3765	3770	3775	3780	3785	3790	3795	5	1	2	3	4	5	6	7	8	9
56	3800	3805	3810	3815	3820	3825	3830	3835	3840	3845	5	1	2	3	4	5	6	7	8	9
57	3850	3855	3860	3865	3870	3875	3880	3885	3890	3895	5	1	2	3	4	5	6	7	8	9
58	3900	3905	3910	3915	3920	3925	3930	3935	3940	3945	5	1	2	3	4	5	6	7	8	9
59	3950	3955	3960	3965	3970	3975	3980	3985	3990	3995	5	1	2	3	4	5	6	7	8	9
60	4000	4005	4010	4015	4020	4025	4030	4035	4040	4045	5	1	2	3	4	5	6	7	8	9
61	4050	4055	4060	4065	4070	4075	4080	4085	4090	4095	5	1	2	3	4	5	6	7	8	9
62	4100	4105	4110	4115	4120	4125	4130	4135	4140	4145	5	1	2	3	4	5	6	7	8	9
63	4150	4155	4160	4165	4170	4175	4180	4185	4190	4195	5	1	2	3	4	5	6	7	8	9
64	4200	4205	4210	4215	4220	4225	4230	4235	4240	4245	5	1	2	3	4	5	6	7	8	9
65	4250	4255	4260	4265	4270	4275	4280	4285	4290	4295	5	1	2	3	4	5	6	7	8	9
66	4300	4305	4310	4315	4320	4325	4330	4335	4340	4345	5	1	2	3	4	5	6	7	8	9
67	4350	4355	4360	4365	4370	4375	4380	4385	4390	4395	5	1	2	3	4	5	6	7	8	9
68	4400	4405	4410	4415	4420	4425	4430	4435	4440	4445	5	1	2	3	4	5	6	7	8	9
69	4450	4455	4460	4465	4470	4475	4480	4485	4490	4495	5	1	2	3	4	5	6	7	8	9
70	4500	4505	4510	4515	4520	4525	4530	4535	4540	4545	5	1	2	3	4	5	6	7	8	9
71	4550	4555	4560	4565	4570	4575	4580	4585	4590	4595	5	1	2	3	4	5	6	7	8	9
72	4600	4605	4610	4615	4620	4625	4630	4635	4640	4645	5	1	2	3	4	5	6	7	8	9
73	4650	4655	4660	4665	4670	4675	4680	4685	4690	4695	5	1	2	3	4	5	6	7	8	9
74																				



Common Logarithm.	Antilogarithmic Canon, being Natural Numbers to Common Logarithms.										Common Difference.	Proportional Parts.									
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
50	31623	1696	1769	1842	1915	31989	2063	2137	2211	2285	74	7	15	22	29	37	44	52	59	66	
51	2359	2434	2509	2584	2659	2734	2810	2885	2961	3037	75	8	15	23	30	38	45	53	60	68	
52	3113	3189	3266	3343	3420	3497	3574	3651	3729	3806	77	8	15	23	31	39	46	54	62	69	
53	3884	3963	4041	4119	4198	4277	4356	4435	4514	4594	79	8	16	24	32	39	47	55	63	71	
54	4674	4754	4834	4914	4995	5075	5156	5237	5318	5400	81	8	16	24	32	40	48	56	65	73	
55	35481	5563	5645	5727	5810	35892	5975	6058	6141	6224	83	8	17	25	33	41	50	58	66	74	
56	6308	6392	6475	6559	6644	6728	6813	6898	6983	7068	84	8	17	25	34	42	51	59	68	76	
57	7154	7239	7325	7411	7497	7584	7670	7757	7844	7931	86	9	17	26	35	43	52	61	69	78	
58	8019	8107	8194	8282	8371	8459	8548	8637	8726	8815	88	9	18	27	35	44	53	62	71	80	
59	8905	8994	9084	9174	9264	9355	9446	9537	9628	9719	91	9	18	27	36	45	54	63	72	81	
60	9811	9902	9994	0087	0179	40272	0365	0458	0551	0644	93	9	19	28	37	46	56	65	74	83	
61	40738	0632	0926	1020	1115	1210	1305	1400	1495	1591	95	9	19	28	38	47	57	66	76	85	
62	1687	1783	1879	1976	2073	2170	2267	2364	2462	2560	97	10	19	29	39	48	58	68	78	87	
63	2658	2756	2855	2954	3053	3152	3251	3351	3451	3551	99	10	20	30	40	50	60	69	79	89	
64	3652	3752	3853	3954	4055	4157	4259	4361	4463	4566	102	10	20	30	41	51	61	71	81	91	
65	44468	4771	4875	4978	5082	45186	5290	5394	5499	5604	104	10	21	31	42	52	62	73	83	94	
66	5709	5814	5920	6026	6132	6238	6345	6452	6559	6666	106	11	21	32	43	53	64	74	85	96	
67	6774	6881	6989	7098	7206	7315	7424	7534	7643	7753	109	11	22	33	44	54	65	76	87	98	
68	7863	7973	8084	8195	8306	8417	8529	8641	8753	8865	111	11	22	33	45	56	67	78	89	100	
69	8978	9091	9204	9317	9431	9545	9659	9774	9888	10003	114	11	23	34	46	57	68	80	91	102	
70	50119	0234	0350	0466	0582	50699	0816	0933	1050	1168	117	12	23	35	47	58	70	82	93	105	
71	1286	1404	1523	1642	1761	1880	2000	2119	2240	2360	119	12	24	36	48	60	72	84	95	107	
72	2481	2602	2723	2845	2966	3088	3211	3333	3456	3580	122	12	24	37	49	61	73	85	98	110	
73	3703	3827	3951	4075	4200	4325	4450	4576	4702	4828	125	12	25	37	50	62	75	87	100	112	
74	4854	5081	5208	5335	5463	5590	5719	5847	5976	6105	128	13	26	38	51	64	77	89	102	114	
75	56234	6364	6494	6624	6754	56885	7016	7148	7280	7412	131	13	26	39	52	65	78	92	105	118	
76	7544	7677	7810	7943	8076	8210	8343	8479	8614	8749	134	13	27	40	54	67	80	94	107	121	
77	8884	9020	9156	9293	9429	9566	9704	9841	9979	0117	137	14	27	41	55	69	82	96	110	124	
78	60256	0393	0534	0674	0813	60954	1094	1235	1376	1518	140	14	28	42	56	70	84	98	112	126	
79	1660	1802	1944	2087	2230	2373	2517	2661	2806	2951	143	14	29	43	57	72	86	100	115	129	
80	63096	3241	3387	3533	3680	63826	3973	4121	4269	4417	147	15	29	44	59	73	88	103	117	132	
81	4565	4714	4863	5013	5163	5313	5464	5615	5766	5917	150	15	30	45	60	75	90	105	120	135	
82	6069	6222	6374	6527	6681	6834	6988	7143	7298	7453	154	15	31	46	61	77	92	108	123	138	
83	7608	7764	7920	8077	8234	8391	8549	8707	8865	9024	157	16	31	47	63	79	94	110	126	141	
84	9183	9343	9503	9663	9823	9984	0146	0307	0469	0632	161	16	32	48	64	80	97	113	129	145	
85	70795	0958	1121	1285	1450	71614	1779	1945	2111	2277	165	16	33	49	66	82	99	115	132	148	
86	2444	2611	2778	2946	3114	3282	3451	3621	3790	3961	168	17	34	51	67	84	101	118	135	151	
87	4131	4302	4473	4645	4817	4989	5162	5336	5509	5683	172	17	34	52	69	86	103	121	138	155	
88	5858	6033	6208	6384	6560	6736	6913	7090	7268	7446	176	18	35	53	71	88	106	124	141	159	
89	7625	7804	7983	8163	8343	8524	8705	8886	9068	9250	181	18	36	54	72	90	108	126	145	163	
90	9433	9616	9799	9983	0168	80353	0538	0724	0910	1096	185	18	37	55	74	92	111	129	148	166	
91	81283	1470	1658	1846	2035	2224	2414	2604	2794	2985	189	19	38	57	76	95	113	132	151	170	
92	3176	3368	3560	3753	3946	4140	4333	4528	4723	4918	194	19	39	58	77	97	116	136	155	174	
93	5114	5310	5507	5704	5901	6099	6298	6497	6696	6896	198	20	40	59	79	99	119	139	158	178	
94	7096	7297	7498	7700	7902	8105	8308	8512	8716	8920	203	20	41	61	81	101	122	142	162	182	
95	9125	9331	9536	9743	9950	90157	0365	0573	0782	0991	207	21	41	62	83	104	124	145	166	187	
96	91201	1411	1622	1833	2045	2257	2470	2683	2897	3111	212	21	42	64	85	106	127	149	170	191	
97	8325	3541	3756	3972	4189	4406	4624	4842	5060	5280	217	22	43	65	87	109	130	152	174	195	
98	5499	5719	5940	6161	6383	6605	6828	7051	7275	7499	222	22	44	67	89	111	133	156	178	199	
99	7724	7949	8175	8401	8628	8855	9083	9312	9541	9770	227	23	45	69	91	114	136	159	182	204	



*Tables of Barometrical and Thermometrical Observations, made in Affghanistan. Upper Scinde, and Kutch Gundava, during the years 1839-40. By Dr. GRIFFITH.*

A copy of these Tables was furnished to the Surveying Officers of the Army of the Indus, as their Barometers ceased to be effective soon after leaving Quettah. No other register was I believe kept.

Columns 8 and 9 require some explanation, they contain the readings off of the Thermometer, Barometer invented by Dr. Woollaston, but with the substitution of an ordinary Thermometer for his delicate one. Of these I have had several in India, but never met with one that was in working order. The great weight and thinness of the bulb, likewise renders them very liable to be broken.

After adjusting the new tubes, and marking on them zero marks corresponding to the zero of the scale, I formed a scale of valuations of each degree from comparisons with the Barometers. I had similar Thermometers in use in Bootan, and have had ample opportunities of knowing that they will intimate altitudes to within trifling differences of travelling Barometers, than which they are much more portable. Ordinary thermometers for ascertaining altitudes by boiling water, vary a good deal, and are not to be depended upon. My instruments are now in Captain Sander's possession, and if they have escaped unbroken, after comparing them with the best barometers in Calcutta, I shall do myself the honour of presenting the results to Government.

These Barometrical observations were made with an Englefield's Barometer, and though made in a dry climate, and with every care, as to drying the inside of the tube with a silk sponging-wire, as well as to allow no air-bubbles to remain, can only be considered as approximative. The mercury was not as pure as it might have been, and none of the Chemists in Calcutta could supply me with fresh distilled mercury.

There is also considerable laxity in the columns of attached and detached thermometers owing to breakages, occasional reduction to one instrument, and the general place of observation, a tent, in different parts of which very various temperatures are to be found.

As I found that screwing, however lightly, the ordinary cistern to the tube (to fix it) occasioned some of the tubes to break, I subsequently, at Cabool, abandoned the plan altogether, and used a wooden box as cistern, sufficiently large to enable the inverted tube, closed by the forefingers, to be inserted under the liquid; the float was adjusted as usual. I can recommend this plan as a practical one, and much easier than the use of the ordinary cistern.

The instrument was put up afresh every day, even during halts,—the tables shew that with care, and using one tube, the readings of various days do not differ very much.

Date.	Station.	Time.	Barm.	Attached Therm.	Det. Therm.	Wollast No. 1 old.	Wollast No. 2.	Barome- ter height in feet.	Therm. height in feet.	Remarks.
Dec. 13	Loodianah,	10 A. M.	29.294	63.	62.	668.5	..	..	..	Cloudy, threatening rain.
"	"	12 "	29.260	64.5	64.	670.0	752.5	..	..	Fine.
"	"	4 P. M.	29.274	64.	64.	671.	752.	..	..	Fine.
14	"	10 A. M.	29.360	63.	63.	671.5	755.	..	..	Fine.
"	"	4 P. M.	29.296	65.	65.	670.	754.5	..	..	Fine.
16	"	10 A. M.	29.316	63.	63.	671.	750.5	..	..	Windy, clear.
"	"	12 "	29.302	64.	64.	..	..	..	..	Windy.
"	"	4 "	29.280	64.5	64.5	669.5	750.5	..	..	Cloudy.
17	"	10 "	29.380	62.	62.5	670.5	751.5	..	..	Cloudy.
"	"	12 "	29.360	65.	65.	..	..	..	..	
"	"	4 "	29.340	65.	65.	671.	750.	..	..	Fine.
19	"	10 "	29.244	63.	63.	668.	750.	..	..	Fine.
"	"	12 "	29.242	65.	66.	..	..	..	..	
"	"	4 "	29.202	66.	66.	668.	748.5	..	..	Cloudy.
20	"	10 "	29.380	66.5	66.	668.5	749.5	..	..	Fineish, wind strong S.
"	"	12 "	29.369	68.	67.	..	..	..	..	
"	"	5 "	29.314	66.	66.	668.5	749.	..	..	Cloudy.
21	"	10 "	29.360	66.	66.	667.5	749.5	..	..	Fine.
"	"	12 "	29.300	68.5	68.	..	..	..	..	Ditto.
"	"	5 "	29.210	66.	66.	..	..	..	..	
22	"	10 "	29.240	65.	64.8	665.5	748.	..	..	Very windy W. S.
"	"	21 "	29.230	66.	66.	..	..	..	..	Ditto.
"	"	4 "	29.210	67.	66.5	664.5	746.5	..	..	ditto hazy.
23	"	10 1/4 "	29.240	67.	66.5	665.	746.5	..	..	ditto clear.

Date.	Station.	Time.	Barm.	Therm. Attached.	Therm. Det.	Woolast No. 1 old.	Woolast No. 2.	Barome-ter height in feet.	Therm. Height in feet.	Remarks.
Dec. 23	Loodianah.	12 A. M.	29.2214	67.	67.	664.5	746.	..	..	Very windy W. S. clear.
"	"	4 "	29.1431.	67.	66.5	663.5	748.	..	..	Ditto ditto.
"	"	10 "	29.2122	65.	64.	..	..	..	..	Fine calm.
"	"	12 "	29.1384	67.	67.	665.	747.	..	..	Ditto.
"	"	4 "	29.1122	66.	66.	..	..	..	..	Fine, ditto.
"	"	10 "	29.410	61.	61.	..	..	..	..	Cloudy, rain.
"	"	12 "	29.404	..	..	..	..	..	..	Rain.
"	"	4 "	29.3314	60.	61.	..	..	..	..	Cloudy.
"	"	12 "	30.031	73.5	..	..	..	..	..	Fine, calm.
Jany. 1	Shikarpore.	4 "	30.000	81.	..	..	..	..	..	Ditto ditto.
"	"	10 "	30.0224	70.	70.	674.	755.5	..	..	Fine, calm.
"	"	12 "	30.0122	77.	77.	..	..	..	..	Calm.
"	"	4 "	29.912.	78.	78.	673.	754.5	..	..	Windy—in gusts, N. N. E.
"	"	10 "	30.000	70.	70.	672.5	752.5	..	..	Fine, calm.
"	"	12 "	29.8411.	78.5	78.	..	..	..	..	Sultry, calm.
"	"	4 "	29.8312.	81.	81.	670.5	752.	..	..	N. W. Moderate wind.
"	"	10 "	29.944	69.	69.	668.5	751.5	..	..	N. E. Wind.
"	"	12 "	29.9017	74.5	..	..	..	..	..	Ditto ditto.
"	"	0	29.8310	79.	..	675.5	751.	..	..	Calm.
"	"	10 "	30.100	68.	..	read just. 677.5	753.5	..	..	5½ A. M. Calm, clear, Themr. 34 in air.
"	"	12 "	30.0415	75.	..	..	..	..	..	Sultry.
"	"	4 "	30.0110	82.5	..	676.8	752.5	..	..	Fine, calm—Themr. 5 A.M. 35.
Feby. 7	"	10 "	30.130	77.5	..	678.	755.5	..	..	

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wollast old.	Wollast new.	Barm. Height.	Therm. Height.	Remarks.
Feb. 7	Shikarpore.	12 A. M.	30.110	79.	..	677.5	753.	..	Mean of all observations reduced according to Broadfoot's remarks 29.838.	Therm—varying from 41 to [92 in the shade.
" "	"	4 "	30.016	82.	..	..	752.	..	..	Calm, sultry, winds.
" 10	"	10 "	29.830	72.5	..	..	..	..	..	Ditto ditto.
" "	"	12 "	29.800	85.	..	6.	752.5	..	..	9 P. M 62.5 A. M. 50.
" 11	"	4 "	29.720	94.	..	673.	751.	..	..	Cloudy, slight E. wind.
" "	"	10 "	29.829	72.	..	..	..	..	..	Sultry.
" "	"	12 "	29.800	85.	..	672.5	752.	..	..	E. wind, strong E. wind.
" 12	"	4 "	29.710	92.	..	670.5	751.5	..	..	E. wind, night.
" "	"	10 "	29.810	76.	..	..	..	..	..	Slight ditto, clear.
" "	"	12 "	29.730	82.	..	670.	751.5	..	..	E. wind, clear cloudy in the [morning.
" 13	"	4 "	29.620	88.	..	668.	750.	..	..	Calm.
" "	"	10 "	29.617	72.	..	..	..	..	..	Strong N. W. hazy.
" "	"	12 "	29.600	81.	..	669.5	750.	..	..	Calm, sultry.
" 14	"	4 "	29.510	88.5	..	669.5	751.5	..	..	Strong wind N. N. W.
" "	"	10 "	29.640	76.5	..	..	..	..	..	Calm, close.
" "	"	12 "	29.630	85.	..	670.	750.	..	..	Calm, cold in the morning.
" 15	"	4 "	29.617	..	..	..	..	..	..	Ditto ditto.
" "	"	10 "	29.847	75.	..	mean 671.6	mean 751.5	..	..	Ditto ditto. [rain in night.
" "	"	12 "	29.824	82.	..	..	..	..	..	Cloudy—E. wind sprinkling
" 16	"	4 "	29.740	85.	..	670.	750.	..	..	
" "	"	10 "	29.910	72.5	..	..	..	..	..	
" "	"	12 "	29.840	82.	..	..	..	..	..	
" "	"	" "	29.8016	86.	..	..	..	..	..	
" 18	"	" "	29.830	68.	..	670.	750.	..	..	

Date.	Station.	Time.	Berm.	Attached Therm.	Detached Therm.	W <sup>coll</sup> old.	W <sup>coll</sup> new.	Berm. Height	Therm. Height	Remarks.
Feb. 18	Shikarpore.	12 A.M.	29.8811	70.	..	671.	751.5	..	..	Showery.
"	"	4	29.800	65.	..	..	..	..	..	Ditto.
"	"	12	29.800	71.	..	..	..	..	..	Fine E. wind.
"	"	4	29.720	72.	..	..	..	..	..	Cloudy.
"	Joke,	10	29.918	80.	..	672.5	753.5	..	..	40.5 A. M. Durand's Bar:
"	"	4	29.882	84.	..	672.	753.	..	..	12 P. M. 30.028 cloudy.
March 1	Bagh,	4	29.812	84.	..	..	..	..	..	Ditto, Bar. 29.939.
2	"	10	29.820	75.	..	..	..	..	..	Calm.
"	"	12	29.835	86.	..	29.8	18.	..	..	Calm, sultry.
"	"	4	29.754	90.	..	Att.	85.4	..	..	Do. Br. at noon 29.950-84.5.
"	"	10	29.887	81.	..	Det.	"	..	..	Do. at 4 do. 29.857-875.
"	"	12	29.848	93.5	..	..	..	..	..	Do. at 10 A. M. 29.909-77.7.
"	"	4	29.771	88.5	88.	..	..	..	..	Do. 12 do. 29.918-90.6.
"	Mysoor,	4	29.725	92.	97.	29.7	62.	..	..	Sultry.
"	"	10	29.783	82.	89.	Att.	88.5	..	..	Sultry.
"	"	12	29.807	89.5	89.	Det.	91.4	..	..	Sultry.
"	"	4	29.732	91.	91.5	..	..	..	..	Calm, 96.
7	Dadur,	10½	29.446	87.	87.	..	..	..	..	Calm.
"	"	12	29.438	88.	88.	..	..	..	..	S. W. wind.
"	"	4	29.930	87.5	87.	..	..	..	..	Cloudy.
"	"	10½	29.843	80.	80.5	..	..	..	..	Calm, passing cloud.
"	"	12	29.372	85.	85.5	..	..	..	..	S. wind.
"	"	4	29.237	80.	81.	..	..	..	..	Cloudy.

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barom. Height.	Therm. Height.	Remarks.
March 9	Dadur.	12 A. M.	29.295	81.5	81.5	29.	351	742.6		W.W., N.W., N.W. [day.
"	"	4 "	29.263	81.	81.	Att.	825			Strong N. wind throughout
"	"	10 "	29.436	70.5	70.5	Det.	824			Clouds of dust wind continued.
" 11	"	10 "								Strong, occasionally violent
"	"	12 "	29.406	80.	80.5	29.	371	Att. 75.	D. 757	[until 12 last night.
"	"	4 "	29.335	70.	71.		186	904.1		Heavy clouds, violent squall.
" 12	Camp river.	11 "	29.218	79.	78.	29.	796			Slight rain about 9 P. M.
"	"	12 "	29.210	83.	85.	Att.	80			Calm.
"	"	4 ½ "	29.130	77.	77.	Det.	Mean			
" 13	Gunnab.	10 "	29.071	81.5	81.5		28.996	108.1		Cloudy.
"	"	12 "	29.063	82.	84.5	Bar.	799			Calm.
"	"	4 "	28.966	84.	85.	Att.	806			Cloudy, windy.
"	"	5 P. M.	28.968	75.	75.	Det.				
" 14	"	10 "	28.988	77.	78.					
"	"	12 "	28.995	85.	85.5					
"	"	5 ½ "	28.920	75.	75.					Cloudy, slight rain at 3 P. M.
" 15	Beebinanca.	10 "	28.429	77.	77.	28.382	82			Fine, clear.
"	"	12 "	28.399	80.	81.	Att.	763	1695		Cloudy, drops of rain.
"	"	5 ½ "	28.317	72.	72.5	Det.	768			Cloudy, but finer.
" 16	Abigoon.	10 "	27.605	72.	71.5					Fine.
"	"	12 "	27.603	73.5	74.	27.535	709	2540		Cloudy, rather rain in night
"	"	4 "	27.524	78.	78.	Att.				and in morning of 17.
" 17	"	10 "	27.513	65.	65.5					Cloudy.

Date.	Station.	Time.	Bar.
March 17	Abigoon...	12 P. M.	27.514
" "	"	4 "	27.454
" 18*	Sirkhagoor.	11 "	25.669
" 20	Mungel. "	12 "	none.
" "	"	5½ "	none.
" 23	Surab. "	10 "	none.
" "	"	4 "	"
" 24	"	10 "	"
" 27	Quettah. "	10 "	24.720
" "	"	4 "	"
April 2	"	10½ "	24.728
" "	"	4 "	"
" 8	Hydroya. "	12 "	25.124
" "	"	4 "	25.043
" 9	Hykulgy. "	1½ "	25.292
" "	"	3 "	25.206
" 11	Kojhak Pass.	2½ "	23.586
" "	"	4 "	23.578

\* New tube the former one having been broken at Sir-i-Bolan.

713.3 622.5 5093 ..  
 713.5 622.5 ..  
 695.5 603.5 ..  
 .. .. ..  
 70. 73. ..  
 Fine clear 201.4.  
 Cloudy.  
 Cloudy, threatening showers.

Date.	Stations.	Time.	Barom.	Attached Therm.	Detached Therm.	Wollast new.	Wollast old.	Barom. Height.	Therm. Height.	Remarks.
June 28*	Killa Azim,	12 A.M.	26.240	95.	95.	..	..	3945	..	No wind; violent W. wind yesterday, 92 with latters.
" 29	Turmink,	12 "	25.858	101.5	101.5	..	..	4418	..	Calm, sultry E. wind up to 11 [A. M.
" 30	Shakr-i,	1 1/4 "	25.699	102.	102.	..	..	..	..	Ditto ditto ditto.
" "	Suja,	1 "	25.689	101.5	101.5	..	..	..	..	Cold morning; strong E. wind, now calm.
" "	"	2 "	25.676	102.	102.	..	..	4618	..	
July 1	Tide anday,	11 "	25.512	95.5	95.5	..	..	..	..	
" "	"	12 "	25.494	99.	99.	..	..	..	..	
" "	"	1 "	" 494	97.5	97.5	..	..	4829	..	W. wind strong ditto, ditto.
" "	"	2 "	" 478	98.	98.	..	..	..	..	Close Sultry E. wind until
" 3	Juldak,	12 "	25.028	95.	95.	..	..	5396	..	Ditto ditto. [8 A. M.
" "	"	1 "	25.004	95.5	95.5	..	..	..	..	Ditto ditto.
" "	"	2 "	24.970	95.	95.	..	..	..	..	Thunder and rain 5, 6 P. M.
" 4	Khilat-i,	3 "	24.714	102.	102.	..	..	..	..	Some clouds, calm, very hot.
" "	"	4 "	24.705	102.8	102.8	..	..	..	..	134° hung in sun, on ground.
" 5	Gilzie,	10 "	24.765	100.	100.	719.	612.8	5773	..	139° W. wind occasionally.
" "	"	11 "	24.753	89.	89.	4 P. M.	..	..	..	Calm, E. wind { 6°, in excess of former adjust-
" "	"	12 "	24.753	91.5	91.5	713.*	614.	..	..	ment, ergo—all
" "	"	1 "	24.743	94.5	94.5	New adjust.	..	..	..	Do. do. strong determinations
" "	"	2 "	24.743	93.	93.	..	..	..	..	Do. do. inguists. from 692.4 P. M.
" "	"	3 "	24.738	95.	95.	97	..	..	..	Do. do. lower.

\* One Thermometer broken, the 2d Column or that of the detached Therm. is quite superfluous.



Date.	Station.	Time.	Bern.	Attached Therm.	Detached Therm.	W. collect new.	W. collect old.	Bern. Height.	Therm. Height.	Remarks.
July 6	Sia-i-Asp,	12 A.M.	24.532	92.	92.	Adjustments vermer corresponds to 760 square, not at base upper edge to the upper most of the two marks.	Index of vermers corresponds to 700 square, not at base upper edge 11 upper most of two marks.	5973	..	Calm, sultry, clear sheet.
"	"	1 "	24.505	91.5	91.5			..	..	W. wind commencing, lighting.
"	...	2 "	24.500	93.5	93.5	Adjustments vermer corresponds to 760 square, not at base upper edge to the upper most of the two marks.	Index of vermers corresponds to 700 square, not at base upper edge 11 upper most of two marks.	..	..	W. wind clouds in the evening.
"	...	1 "	24.402	91.5	91.5			..	..	Calm, not very close.
"	Taze Noorok,	2 "	24.378	91.	91.			6136	..	W. E. wind, slight air fresh.
"	Taze,	12 1/2 "	24.193	89.	89.			..	..	Cloudy morning, slight N.E.
"	..	1 "	24.185	87.	87.			6321	..	Cool. [wind.
"	..	2 "	24.181	84.	84.			..	..	N. E. wind strong, cool.
"	Shuftul,	12 "	24.058	84.	84.			..	..	Calm, cloudy 46° sunrise 10th.
"	..	1 "	24.046	86.	86.			..	..	Occasional breezes.
"	..	2 "	24.046	87.	87.			..	..	Cloudy W. wind, clear night.
"	..	12 "	24.062	88.5	88.5			6514	..	Strong W. wind.
"	..	1 "	24.054	91.5	91.5			..	..	Ditto ditto, scattered clouds.
"	..	2 "	24.006	91.	91.			..	..	Ditto ditto clear, clear night.
"	Chushum	12 "	28.941	89.	89.			..	..	W. wind getting up.
"	Shadee,	1 "	23.941	89.	89.			6668	..	W. wind.
"	..	2 "	23.934	90.	90.			..	..	Ditto ditto clear, 9 P. M.
"	..	12 "	23.858	90.	90.			..	..	[tial clouds.
"	..	1 "	23.806	91.8	91.8	704.	605.	6810	..	S. W. wind commence, partial clouds.
"	..	2 "	23.806	92.	92.	..	..	..	{ 6621 new.	Cloudy.
"	..	3 "	23.806	92.	92.	..	..	..	{ 6745 old.	Overcast, S. W. wind.

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.
July 13	Ajoghan, ..	1 A.M.	23.609	89.	89.
"	"	2 "	23.586	90.	90.
"	14 Mookhloor, ..	1 "	23.520	86.5	86.5
"	"	2 "	23.520	88.5	88.5
"	"	10 "	23.601	90.	90.
"	"	11 "	23.594	81.5	81.5
"	"	12 "	23.594	83.	83.
"	"	1 "	23.591	85.	85.
"	"	2 "	23.591	85.	85.
"	"	3 "	23.586	86.5	86.5
"	"	4 "	23.578	86.	86.
"	16 Aba, ...	1 "	23.397	86.	86.
"	17 Jumrat, ..	1 "	23.805	87.	87.
"	"	2 "	23.287	87.	87.
"	"	12 "	23.453	83.	83.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	W collast. new.	W collast. old.	Barm. Height.	Therm. Height.	Remarks.
July 18	Near Moo-roohikee, } 1 Mile S.W. dist.	1 A.M.	23.435	85.	85.	..	..	7309	..	Calm, clear, rain from 11-12 at night.
"		2 "	23.412	88.	88.	698.5	597.	..	..	Calm, some clouds.
"	Urgutto, ..	12 "	23.277	81.	81.	696.3	596.8	..	..	W. wind slight.
"		1 "	23.263	83.	83.	..	..	7502	{ 7391 old.	Thunder and heavy clouds to N. and W. E.
"	..	2 "	23.246	86.	86.	697.6	597.6	..	..	Calmish, or slight W. wind, clear, no rain last night.
"	Nanee, ..	1 "	23.336	91.	91.	697.1	697.2	..	..	Calm, sultry.
"	Ghuznee, ..	10 "	..	..	86.	696.	596.8	..	..	Westerly wind light.
"		12 "	23.060	87.	87.	..	..	..	..	Cloudy morning.
"	..	1 "	23.038	88.	88.	..	..	..	..	
23	..	10 "	23.031	87.	87.	..	..	..	..	
"	..	11 "	23.030	88.	88.	695.	594.2	..	..	
"	..	12 "	23.016	..	..	..	..	..	..	
"	..	1 1/4 "	22.986	..	..	..	..	..	..	
"	..	2 "	22.986	..	..	..	..	..	..	
"	..	3 "	22.960	..	..	..	..	..	..	
"	..	4 "	22.960	..	..	693.1	593.5	..	..	Strong E. N. E. wind from 6 till 11 A. M. clouds of dust.
"	..	10 "	23.060	82.	82.	694.7	595.5	..	..	E. N. E. gusts, occasionally clear.

Date.	Station.	Time.	Barm.	Attached. Therm.	Detached Therm.	Wcollast new.	Wcollast. old.	Barm. Height.	Therm. Height.	Remarks.
July 24	Ghuznee, ...	11 A.M.	23.042	83.	83.	..	..	..	..	E. N. E. gusts, occasionally [clear.
"	"	12	23.042	84.	84.	..	..	..	..	Ditto, but steadier.
"	"	1	23.039	87.	87.	..	..	..	..	Ditto ditto.
"	"	2	23.012	87.	87.	..	..	..	..	Calm.
"	"	3	23.000	88.	88.	694.5	593.3	..	..	Calmish, or slight N. E. wind.
"	"	4	22.976	89.	89.	695.	596	..	..	Calm, clear.
" 25	"	10	23.100	83.	83.	..	..	..	..	Calm, clear.
"	"	11	23.092	85.	85.	..	..	..	..	Rather cloudy.
"	"	12	23.093	87.5	87.5	..	..	..	..	Calm.
"	"	1	23.060	88.5	88.5	..	..	..	..	Calm, clear.
"	"	2	23.060	90.	90.	..	..	..	..	Slight S. W. wind.
"	"	3	23.042	89.	89.	693.1	593.9	..	..	Calm, clear, close.
"	"	4	23.033	89.	89.	694.9	594.8	772.6	new.	Ditto ditto,
" 26	"	10	23.058	83.	83.	..	..	..	7717	Ditto ditto.
"	"	11	23.052	86.	86.	..	..	..	old.	Ditto ditto.
"	"	12	23.038	89.	89.	..	..	..	7665	S. W. wind.
"	"	2	23.000	90.	90.	..	..	..	mean.	Ditto ditto.
"	"	3	22.996	90.	90.	..	..	..	7691	Calm, S.W. wind, slight, and light squall from S. E.
"	"	4	22.996	91.	91.	692.9	592.3	..	..	9, 10 P. M.

Mean of all Observations.  
Barom. .... 23.035  
New Wool. 694.5  
Old ditto. 594.5  
Therm. .... 89.0

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	W collast. new.	W collast. old.	Barm. Height.	Therm. Height.	Remarks.
July 27	Ghuznee, ..	10 A.M.	23.097	78.	78.	696.	595.	..	..	Much thunder. In a Mosque.
"	"	11 "	23.086	76.	76.	..	..	..	..	Calm, clear.
"	"	12 "	23.080	76.	76.	..	..	..	..	Ditto ditto.
"	"	1 "	23.060	76.	76.	..	..	..	..	
"	"	2 "	23.043	76.	76.	..	..	..	..	
"	"	3 "	23.026	75.	75.	..	..	..	..	Somewhat cloudy, heavy rain with thunder, strong gusts, varying direction from 9 to 10 P. M.
"	"	4 "	23.005	76.	76.	694.	594.1	..	..	Calm, clear, cloudy to E.
" 28	"	10 "	23.085	76.	76.	696.1	596.3	..	..	
"	"	11 "	23.072	76.	76.	..	..	..	..	
"	"	12 "	23.050	76.	76.	..	..	..	..	Cloudy.
"	"	1 "	23.034	76.	76.	..	..	..	..	Ditto.
"	"	2 "	23.015	..	76.	..	..	..	..	Partially cloudy; calm.
"	"	3 "	23.007	..	76.	..	..	..	..	Threatening E. N. E. no rain although cloudy till morning.
"	"	4 "	23.005	76.	76.	693.7	594.7	..	..	
" 29	"	10 1/4 "	23.070	76.	76.	..	..	..	..	Clear, calm.
"	"	11 "	23.055	76.	76.	..	..	..	..	Ditto ditto.
"	"	12 "	23.038	76.	76.	..	..	..	..	Ditto ditto.
"	"	1 "	23.022	76.	76.	..	..	..	..	
"	"	2 "	23.004	76.	76.	..	..	..	..	
"	"	3 "	22.990	76.	76.	..	..	..	..	Ditto S. W. wind strong, hazy.

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barom. Height.	Therm. Height.	Remarks.
July 29	Ghuznee, ..	4 A.M.	22.985	76.	76.	685.9	584.2	..	..	Violent S. W. wind, dust.
" 30	Shushgoa, ..	1 1/4 "	22.323	85.	85.	..	..	..	..	Ditto ditto 686.1.
" "	"	2 "	22.315	86.	86.	..	..	..	..	Ditto ditto 584.1.
" "	"	3 "	22.297	85.	85.	..	..	..	new.	Wind somewhat less violent, reset to obviate mistakes, wind continues, but less.
" "	"	4 "	22.243	84.	84.	686.4	584.1	8697	8711	
" "	"	4 1/4 "	22.298	84.	84.	..	..	..	old.	
" "	"	5 "	22.287	83.	83.	..	..	..	8768	
" 31	Huftasya, ..	11 "	22.533	81.	81.	688.4	588.2	..	mean.	Calm, clear. Therm. 46.8 P. M.
" "	"	12 "	22.527	85.	85.	..	..	..	8739	
" "	"	1 "	22.524	85.	85.	..	..	B. 8420	42 feet. excess.	Calm.
" "	"	2 "	22.515	85.	85.	..	..	..	8460 old.	S. W. wind getting up. {onally.
" "	"	3 "	22.500	86.	86.	687.8	585.6	..	8485	S. S. W. wind; strong occasi-
" "	"	1 "	23.168	91.	91.	694.5	595.4	..	..	Ditto ditto very clear.
Aug. 1	Hyderkhet, ..	2 "	23.160	92.	92.	..	..	7637	new.	S. S. wind getting up, blows [down valley.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollest. new.	Woollest. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 1	Hyderkhet,	2 1/2 A.M.	23.145	95.	95.	695.1	594.6	..	old. 7657	Calmish.
"	"	8 "	23.145	98.	98.	696.1	597.8	..	..	Dust, S. wind.
"	Shaikabad,	1 "	23.862	95.	95.	697.7	597.8	..	new. 7468	Calm sultry { Means, 23.812
"	"	10 "	23.350	87.	87.	696.3	595.7	..	old. 7428	Calm, clear, Therm. 93.6
"	"	11 "	23.350	91.	91.	691.4	590.4	7473	new. 818.8	Ditto ditto, New,... 696.7
"	"	12 "	23.886	91.	91.	691.4	590.4	..	..	Ditto ditto, Old,... 596.8
"	"	2 P.M.	23.266	93.	93.	691.4	590.4	..	..	W. N. W. wind strongish.
"	"	3 "	23.262	95.	95.	691.4	590.4	..	..	Ditto ditto ditto.
"	"	4 "	23.255	94.	94.	691.4	590.4	..	..	Very strong wind.
"	Kilsah Sir,...	1 1/2 "	22.830	89.	89.	691.4	590.4	..	..	Occasional S. S. W. gust, clear elastic.
"	"	"	"	"	"	"	"	"	"	"
"	Mahomed,...	12 "	22.820	89.	89.	691.4	590.4	8051	82.31	Ditto { Means, 22.837
"	"	2 "	22.860	91.	91.	691.4	590.4	..	..	Therm... 89.7
"	"	4 "	..	90.	90.	689.7	588.4	..	..	New,... 690.5
"	"	"	"	"	"	"	"	..	..	Old,... 589.4
"	"	"	"	"	"	"	"	..	..	Occasional gusts, small whirlwinds.
"	"	11 "	23.110	87.	87.	694.9	594.6	..	..	Common scattered clouds, calm, clear.
"	"	12 "	23.080	89.	89.	694.9	594.6	7747	..	Cloudy, close, or S. breezes.

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	W <sup>ool</sup> last. new.	W <sup>ool</sup> last. old.	Barom. Height.	Therm. Height.	Remarks.
Aug. 5	Mahomed, ..	1 A.M.	23.667	89.	89.	693.9	593.1	4 P.M.	..	N. N. E. wind, threatening
"	..	3 "	23.040	86.	85.	691.9	593.8	..	..	Very windy N. N. E. [night.
"	Urgunda, ..	11 "	23.089	..	..	..	..	..	..	N. N. E. wind.
"	..	12 "	23.081	..	..	..	..	7628	..	Ditto do. gusts, rather cloudy.
"	..	1 "	23.081	..	..	..	..	..	..	Ditto ditto, strong wind.
"	..	3 "	23.034	..	..	693.4	591.4	..	..	Heavy clouds to N. with thunder storm, rain also towards morning.
7	Kilah, ..	12 P.M.	24.071	100.	100.	704.8	606.8	..	..	Calm, sultry, cloudy to N.
"	Kazie, ..	1 "	24.071	..	..	4 P.M. 703.3	4 P.M. 605.	..	..	Cloudy E. windy, light.
"	..	2 "	24.069	..	..	706.4	606.4	..	..	Very strong wind 4 P. M. calm, very close, cloudy, all night [close.
8	..	10 "	24.112	..	..	..	..	..	..	Calm, sultry.
"	..	11 "	24.108	..	..	..	..	..	..	Ditto, very hot.
"	..	12 "	24.097	..	..	..	..	..	..	Ditto ditto, cloudy to N.
"	..	1 "	24.080	..	..	..	..	6508	..	Ditto ditto, overcast.
"	..	2 "	24.070	..	..	..	..	..	..	Ditto, cloudy.
"	..	3 "	24.025	..	..	..	..	..	..	Threatening rain.
"	..	4 "	24.016	..	..	705.1	606.4	..	..	Ditto ditto.
"	..	10 "	24.078	..	..	704.2	606.1	..	..	Close, calm, hazy.
9	..	11 "	24.060	..	..	..	..	..	..	Calm, close.
"	..	12 "	24.048	..	..	..	..	..	..	N. E. wind slight.
"	..	1 "	24.020	..	..	..	..	..	..	Ditto ditto.
"	..	2 "	24.008	..	..	..	..	..	..	



Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	W collast. new.	W collast. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 9	Kazie, ..	8 PM.	23.968	..	..	5 PM.	5 PM.	..	..	N. E. wind slight.
" 10	Baber's Tomb, ..	4 "	23.948	..	..	702.4	603.4	..	..	Violent winds from N. W.
" 11	Cabul, ..	10 "	24.187	75.	75.	704.6	605.8	..	..	Clear, calmish. [bearing.
" "	Baber's Tomb, ..	11 "	24.188	..	..	..	..	..	..	Ditto ditto.
" "	..	12 "	24.183	..	..	..	..	..	..	
" "	..	1 "	24.068	80.	80.	..	..	..	..	
" "	..	2 "	24.054	..	..	..	..	6396	..	
" "	..	3 "	24.140	..	..	..	..	..	..	
" "	Baber's Tomb, ..	4 "	24.125	91.	91.	703.8	605.4	..	..	Slight breezes clear, clear night.
" 12	..	10 "	24.140	75.	75.	..	..	..	..	Slight cool breezes, clear.
" "	..	12 "	24.124	..	..	..	..	..	..	Clear.
" "	..	4 "	24.040	85.	85.	..	..	..	..	Ditto.
" 13	..	8 "	24.158	63.	63.	..	..	..	..	Br. summit of ridges on which wall built 23.111. Therm. 60.7½ A. M.
" "	..	9 "	24.158	..	..	..	..	..	..	Cool breezes, clear.
" "	..	11 "	24.158	..	..	..	..	..	..	
" "	..	12 "	24.161	85.	85.	..	..	..	..	
" "	..	1 "	24.161	..	..	..	..	..	..	[at evening.
" "	..	2 "	24.145	..	..	..	..	..	..	High wind from N. as usual
" "	..	3 "	24.116	..	..	..	..	..	..	Clear fine, 13 fine night.
" 16	..	10 "	24.200	75.	75.	..	..	..	..	Ditto ditto.
" "	..	11 "	24.190	75.	75.	..	..	..	..	Ditto ditto.
" "	..	12 "	24.176	76.	76.	..	..	..	..	

		Barom.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barom. Height.	Therm. Height.	Remarks.
25	1 Pass, ..	24.163	79.	79.	..	..	..	..	Clear, fine.
"	Sufaid Sum- mut, ..	24.135	85.	85.	..	..	..	..	Ditto ditto.
"	Khake Kote, ..	24.115	83.	83.	..	..	..	..	Ditto ditto.
"	Ashraf, ..	24.100	82.	82.	..	..	..	..	Clear.
"	"	24.223	80.	80.	..	..	..	..	Ditto.
"	"	24.187	84.	84.	..	..	..	..	Ditto.
"	"	24.172	86.	86.	..	..	..	..	Clear, or broken tube 25.285.
"	"	24.135	86.	86.	..	..	..	..	Misty, rain last evening.
"	"	22.148	60.	60.	..	..	8670	..	
"	"	28.002	68.	68.	..	..	..	..	Hazy.
"	"	22.970	74.	74.	692.6	591.8	..	..	Clouds with sunshine.
"	"	22.964	75.	75.	..	..	7749	..	Cloudy, threatening to East.
"	"	22.985	70.	70.	..	..	..	..	Threatening from W. thun- der, heavy storm from W.
"	"	22.182	75.	75.	..	..	..	..	Hazy and close, rainy yester- day.
"	"	22.128	70.	70.	..	..	8836	..	Cloudy.
"	"	20.365	80.	80.	664.1	559.2	..	..	Occasional gusts of wind, clear.
"	"	20.850	70.	70.	..	..	11320	..	Occasional gusts of cold brack- ing wind.
"	"	20.830	74.	74.	..	..	..	..	Occasional gusts, W. N.W.
"	"	20.830	73.	73.	659.2	564.8	10618	..	wind clear.
"	"	20.830	71.	71.	..	..	..	..	Ditto ditto.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wollast new.	Wollast old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 29	Yonutt, ..	10 A.M.	20.844	66.	66.	668.9	564.6	..	..	Strongish W. wind. Therm. 46° 6 P.M.
"	..	11 "	20.832	68.	68.	..	..	..	..	Clear, bracing strong wind.
"	..	12 "	20.826	73.	73.	..	..	..	..	Ditto ditto, hazy.
"	..	1 "	20.821	74.	74.	..	..	..	..	Wind strong, hazy, broken
30	Helmund, ..	8 "	22.206	68.	68.	..	..	100.76	..	[tube 21.947.
"	Sea Sung, ..	2 P.M.	20.984	69.	69.	670.6	565.4	..	..	Wind strong down ravine, clear.
"	..	3 "	20.925	68.	68.	..	..	104.88	..	Ditto ditto, clear.
"	..	4 P.M.	20.920	67.	67.	..	..	..	..	Ditto ditto ditto.
31	Top of Ascent.	10½ A.M.	20.320	80.	80.	..	..	113.70	..	Sheltered.
"	Hajuguk, ..	4½ "	19.755.	80.	80.	656.8	548.3	121.90	..	E. N. E. wind rather sheltered.
"	Top of do Halt.	1¼ P.M.	20.660	70.	70.	..	..	..	..	
"	..	2¼ "	20.648	67.	67.	..	..	..	..	
"	Rulloo, ..	3¼ P.M.	20.658	65.	65.	668.1	562.4	108.83	..	
"	..	4 "	20.658	65.	65.	..	..	..	..	Clouds near Koh-i-Baba.
"	..	5 "	20.664	62.	62.	..	..	..	..	Temp. of spring 4 P. M. 45°.
Sept. 1	Kulloo Karood	1½ "	21.424	76.	76.	..	..	..	..	(Major Thomson.)
"	or Sokhtah,	2¼ "	21.413	76.	76.	674.8	571.5	983.9	..	Clear, calm. Therm. 30.6
"	..	4 "	21.411	66.	66.	..	..	..	..	[A. M.
"	..	..	..	..	..	..	..	..	..	Rather cloudy, clear night,
2	Kaloo Pass	11 A.M.	19.582	66.	66.	651.9	545.1	..	..	Therm. 34° 6 A. M.
"	Summit, ..	11½ "	19.506	67.	67.	..	..	124.81	..	Slight northerly wind, clear.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
Sept. 2	Topchie, ..	4 P.M.	21.995	75.	75.	681.	578.1	..	..	Cloudy, Ther. 50° 5 A. M.*
"	"	5 "	21.990	71.	71.	..	..	90.85	..	Cloudy, threatening, close.
" 3	Bamean, ..	2 P.M.	23.380	77.	77.	685.2	584.	..	..	Occasional gusts from Koh-i-
"	"	3 "	22.380	73.	73.	..	..	..	..	Baba. [106°
"	"	4 "	22.376	73.	73.	..	..	..	..	Squally. On carpet in sunshine
" 4	"	9½ A.M.	22.511	60.	60.	685.5	585.9	..	..	Clear, serene.
"	"	10 "	22.511	62.	62.	..	..	..	..	Ditto.
"	"	11 "	22.490	66.	66.	..	..	..	..	Close, sultry.
"	"	12 "	22.460	75.	75.	..	..	..	..	Ditto ditto. [W.
"	"	2 P.M.	22.430	80.	80.	686.1	584.5	..	..	Cool breezes from S. or S. S.
"	"	2½ "	22.428	78.	78.	..	..	8496	..	Ditto ditto. [A. M.
" 5	"	10 A.M.	22.456	63.	63.	685.8	586.	..	..	Calm, clear, Therm. 28° 30° 6
"	"	11 "	22.440	70.	70.	..	..	..	..	Ditto in sun 100° (hottest)
"	"	12 "	22.429	76.	76.	..	..	..	..	part of day.
"	"	1 P.M.	22.407	76.	76.	..	..	..	..	Ditto.
"	"	1 "	22.720	75.	75.	..	..	..	..	Ditto.
" 6	Nohawk, ..	"	22.685	76.	76.	..	..	..	..	Calm, clear.
"	Kotul, ..	"	21.937	69.	69.	..	..	8186	..	Ditto. [Pass.
" 7	Erak, ..	9 A.M.	22.129	75.	75.	..	..	9155	..	Clear, 50 ft. below Summit of
"	"	1 P.M.	22.125	76.	76.	682.	580.9	..	..	[Ravine.
"	"	2 "	22.125	76.	76.	..	..	8914	..	Clear, occasional gusts down

\* From this the calculations for the height indicated by the two Woollaston Thermometers, it will be seen are discontinued. There is ample evidence to shew how accurate their indications generally are.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	W collst. New.	W collst. old.	Barm. Height.	Therm. Height.	Remarks.
Sept. 8	Halt high up	12½ PM.	20.180	62.	62.	661.	555.3	..	..	Flying clouds.
"	Erak Ravine,	1 "	20.164	61.	61.	..	..	..	..	Ditto ditto.
"	"	2 "	20.147	58.	58.	..	..	11.545	..	Cloudy.
"	"	3½ "	20.135	59.	59.	..	..	..	..	Partial clouds.
9	Summit of	9 A.M.	19.190	56.	56.	..	..	..	..	..
"	Erak Pass,	9½ "	19.236	60.	60.	648.5	539.1	12.909	..	Slight hail, sunshine & clouds.
"	Kurzar.	1½ PM.	20.585	51.	51.	666.8	560.1	..	..	..
"	"	2 "	20.567	56.	56.	..	..	10.939	..	Sunshine and clouds. Therm. 6 A. M. 31°.
"	"	"	"	"	"	"	"	"	"	"
10	Helmund Gir-	2 "	21.215	67.5	67.5	673.6	568.3	10.076	..	At 1 P.M. violent squall from [East. Threatening.
"	dun Dewar,	3 "	21.207	61.5	61.5	..	..	..	..	Slight rain, threatening.
"	Ravine, ..	6 "	20.884	55.	55.	670.3	565.	10.522	..	Clouds and sunshine with oc-
11	Sir-i-	2½ "	22.199	69.	69.	684.	582.	..	..	casional breezes.
12	Chushm, ..	3 "	22.185	68.	68.	..	..	883.6	..	..
"	"	4 "	22.201	66.	66.	..	..	..	..	..
13	Jubraiz, ..	10½ AM.	22.791	68.	68.	689.2	588.9	..	..	Easterly breezes, very clear.
"	"	11 "	22.763	70.	70.	..	..	..	..	Ditto.
"	"	12 "	22.760	75.	75.	..	..	..	..	Calm, hot.
"	"	1½ PM.	22.749	79.	79.	..	..	808.2	..	Ditto ditto.
"	"	2 "	22.749	78.	78.	..	..	..	..	Easterly breezes.
"	"	2½ "	22.749	77.5	77.5	..	..	..	..	Ditto.
14	Kote-i-Ashruf,	12½ "	23.109	82.	82.	694.4	594.9	..	..	Cloudy.
"	"	1 "	23.081	82.	82.	..	..	774.9	..	Ditto.
"	"	2 "	23.048	78.	78.	..	..	..	..	Sudden dry squall from W.

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	W collast. new.	W collast. old.	Barom. Height.	Therm. Height.	Remarks.
Sept. 15	Khak-i-Sofaid Pass,	7½ A.	22.376	67.	67.	68.3.3	582.6	5670	..	Fine, clear.
"	Urghundi,...	11 "	23.265	75.	75.	..	..	..	..	Fine, clear.
"	..	12 "	23.260	80.	80.	..	..	..	..	Cloudy, E. breezes.
"	..	1 P.M.	23.235	79.	79.	692.7	594.	7628	..	Sunshine and cloudy.
"	..	2 "	23.224	79.	79.	..	..	..	..	Ditto do. strongish E. breezes.
"	..	3 "	23.192	74.	74.	692.7	592.5	..	..	Ditto ditto.
"	..	4 "	23.186	73.	73.	..	..	..	..	Ditto ditto.
"	..	5 "	23.184	72.	72.	..	..	..	..	Cloudy ditto ditto.
"	Baber's Pillar, ...	10½ A.	22.434	62.	62.	683.5	581.5	..	..	Cloudy ditto ditto.
Oct. 1*	Cabul, ...	11 "	24.322	73.	73.	..	..	..	..	Calm, clear.
"	Newcamp to	12 "	24.810	75.	75.	..	..	..	..	Ditto.
"	C. of Town,	1 P.M.	24.290	75.	75.	..	..	..	..	Ditto.
"	..	2 "	24.257	78.	78.	..	..	..	..	Ditto.
"	..	3 "	24.245	78.	78.	..	..	..	..	Ditto.
"	..	4 "	24.234	78.	78.	..	..	..	..	Ditto. Therm. 114° in sun.
"	..	5½ "	24.238	75.	75.	..	..	..	..	Ditto.
"	..	10 A.M.	24.347	72.	72.	..	..	..	..	Calm, clear.
"	..	11 "	24.325	75.	75.	..	..	..	..	Ditto.
"	..	12 "	24.316	77.	77.	..	..	..	..	Ditto ditto, strong winds.
"	..	1 P.M.	24.314	77.	77.	..	..	..	..	Ditto ditto at 7 P. M.
"	..	2 "	24.300	78.	78.	..	..	..	..	Ditto ditto from the North.

\* From this period the cistern obtained with the instrument was not continued in use, but a wooden cup was substituted in its place.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wcollat. new.	Wcollat. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 2	New camp to	9 P.M.	24.283	79.	79.	..	..	..	..	Calm, clear from the North.
" "	C. of Town,	4 "	24.288	77.	77.	..	..	..	..	Ditto ditto.
" 3	..	10 A.M.	24.388	78.	78.	..	..	..	..	Calm, clear.
" "	..	11 "	24.388	75.	75.	..	..	..	..	
" "	..	12 "	24.380	76.	76.	..	..	..	..	
" "	..	1 P.M.	24.340	78.	78.	..	..	..	..	
" "	..	2 "	24.340	78.	78.	..	..	..	..	Northerly breezes.
" "	..	3 "	24.316	76.	76.	..	..	..	..	Ditto. } Strong at 8, and 9
" "	..	4 "	24.307	75.	75.	..	..	..	..	Ditto. } P. M.
" 5	..	10 A.M.	24.338	70.	70.	..	..	..	..	Calm, clear.
" "	..	11 "	24.326	70.	70.	..	..	..	..	Ditto.
" "	..	12 "	24.320	73.	73.	..	..	..	..	Ditto.
" "	..	2 P.M.	24.280	74.	74.	..	..	..	..	Ditto.
" "	..	3 "	24.263	74.	74.	..	..	..	..	Ditto.
" "	..	4 "	24.260	73.	73.	..	..	..	..	Ditto.
" 6	Boothkah,	11 A.	24.347	70.	70.	705.0	607.8	..	..	Calm, clear,
" "	..	12 "	24.302	70.	70.	..	..	..	..	Ditto.
" "	..	1 P.M.	24.274	71.	71.	..	..	6247	..	Small whirlwinds or
" "	..	2 "	24.274	71.	71.	..	..	..	..	devils very com-
" "	..	3 "	24.271	72.	72.	..	..	..	..	mon.
" 7	Khod,	12 "	23.293	64.	64.	695.1	596.	..	..	North winds in gusts.
" "	..	1 "	23.280	64.	64.	..	..	7466	..	Ditto.
" "	..	2 "	23.272	64.	64.	..	..	..	..	Ditto.
" "	..	3 "	23.260	66.	66.	694.9	595.3	..	..	Ditto.

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barom. Height.	Therm. Height.	Remarks.
Oct. 8	Tarzeen, ..	1 P.M.	24.053	70.	70.	702.5	605.	..	..	Clear, fine.
"	"	2 "	24.066	69.	69.	..	..	..	..	Ditto.
"	"	3 "	24.062	69.	69.	..	..	6488	..	Ditto.
"	"	4 "	24.054	68.	68.	702.5	605.1	..	..	Ditto.
"	"	10 A.M.	24.066	66.	66.	..	..	..	..	
10	Barikab, ..	1 1/4 P.M.	25.120	78.	78.	..	..	..	..	Calmish, clear.
"	"	2 "	25.125	78.5	78.5	713.5	617.5	..	..	Ditto.
"	"	3 "	25.118	78.	78.	..	..	5313	..	Ditto.
"	"	4 "	25.098	78.	78.	713.8	616.5	..	..	Ditto.
"	"	4 1/4 "	25.086	72.	72.	..	..	..	..	Sunset below hills.
"	Jugdulluk, ..	1 1/4 "	25.040	74.	74.	..	..	..	..	Calmish, clear.
"	"	2 "	25.042	74.	74.	..	..	..	..	Ditto.
"	"	4 "	24.960	73.	73.	712.3	615.3	5875	..	Cloudy, S. horizon heavy.
"	"	10 A.M.	25.130	61.	61.	712.	616.6	..	..	Clear, calm.
12	"	11 "	25.100	63.	63.	..	..	..	..	Ditto.
"	"	1 P.M.	25.921	82.	82.	720.8	625.9	..	..	Calm, clearish.
"	Soukhab, ..	2 "	25.907	81.	81.	..	..	4373	..	Ditto.
"	"	3 "	25.907	81.	81.	..	..	..	..	Clouds to E. S. E.
"	"	12 "	25.746	74.	74.	..	..	..	..	Clear, calm.
Oct. 14	Gumdumuk	1 P.M.	25.702	76.	76.	..	..	..	..	
"	"	2 "	25.702	76.	76.	..	..	..	..	
"	"	2 1/4 "	25.696	76.	76.	720.	625.6	4616	..	
"	"	10 A.M.	25.688	72.	72.	718.8	623.3	..	..	
"	"	11 "	25.670	72.	72.	..	..	..	..	Rather cloudy and close.



Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	W <sup>coll.</sup> new.	W <sup>coll.</sup> old.	Bar.	Therm. Height.	Remarks.
Oct. 15	Gundumuk,	12 "	25.660	70.	70.	718.5	628.5	..	..	Overcast, snowy on Sofaid Koh.
" 16	Futtehabad,	12½ PM.	27.058	80.	86.	..	..	..	..	Clear, calm.
" "	"	1 "	27.046	78.	85.	..	..	..	..	Ditto ditto.
" "	"	2 "	27.035	79.	86.5	..	..	..	..	Ditto ditto.
" "	"	2½ "	27.020	88.	88.	731.9	638.	..	..	Ditto ditto, close.
" "	"	3 "	27.020	77.	87.	..	..	..	..	Ditto ditto.
" "	"	4½ "	27.020	74.	82.	..	..	..	..	Ditto ditto.
" 17*	"	10 AM.	27.140	76.	81.	..	..	..	..	Calm, close, clear.
" "	"	10½ "	27.140	76.	83.	732.4	638.2	..	..	Ditto ditto.
" "	"	11 "	27.140	76.	83.	..	..	3098	..	[in sun 96°.
" "	"	12 "	27.106	76.	83.	..	..	..	..	Clear and light breezes, Therm.
" "	"	1 PM.	27.095	76.	85.	..	..	..	..	Ditto ditto.
" "	"	2 "	27.096	78.	84.	..	..	..	..	Ditto ditto.
" "	"	3 "	27.060	80.	84.	..	..	..	..	Ditto ditto.
" "	"	3½ "	27.030	77.	83.	731.	637.5	..	..	Ditto ditto.
" "	"	4 "	27.030	75.	81.	..	..	..	..	Ditto ditto.
" 19†	"	10½ AM.	27.187	70.	71.	732.	639.8	..	..	E. winds, very clear.
" "	"	11 "	27.180	71.	74.	..	..	..	..	Ditto ditto ditto.
" "	"	12 "	27.170	72.	75.5	..	..	..	..	Ditto ditto, Therm. 85° in sun.
" "	"	1 PM.	27.164	73.	78.	..	..	..	..	Ditto.
" "	"	2 "	27.164	75.	79.	..	..	..	..	Ditto.
" "	"	3 "	27.140	76.	81.	731.	639.	..	..	Strong E. wind.

\* This is the first Pass between Tohawk and the Erak Valley.

† Barometer put up twice, 2d Observation most correct.

Date.	Station.	Time.	Berm.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barom. Height.	Therm. Height.	Remarks.
Oct. *20	Sultanpore,	11 A.M.	27.963	76.	79.	739.8	647.5	..	..	Calm, close, sultry.
"	"	12 "	27.946	76.	82.	..	..	..	..	Occasional gusts from W.
"	"	1 "	27.920	76.5	84.	..	..	2286	..	Ditto ditto.
"	"	2 "	27.882	78.	85.5	..	..	..	..	Ditto ditto.
"	"	3 "	27.857	78.	85.5	738.8	646.5	..	..	Ditto ditto.
"	"	12 "	28.205	79.	90.5	..	..	..	..	Clear, close, calm, 104° in sun.
21	Jelalabad.	1 P.M.	28.175	78.	92.	..	..	..	..	Ditto ditto, 106° in sun.
"	"	2 "	28.114	80.	92.	..	..	..	..	Ditto ditto, 109° ditto.
"	"	4 "	28.083	77.	90.	..	..	..	..	Ditto ditto, 96° ditto.
"	"	10 A.M.	28.155	68.	74.	741.	649.	..	..	Ditto ditto, 44° sunrise.
22	"	11 "	28.128	70.	76.	..	..	..	..	Ditto ditto.
"	"	12 "	28.110	74.	80.	..	..	..	..	Ditto ditto.
"	"	1 P.M.	28.083	77.	83.	739.5	648.3	..	..	Ditto ditto.
"	"	2 "	28.040	79.	84.	..	..	..	..	Ditto ditto.
"	"	2 1/4 "	28.082	79.	85.	..	..	1964	..	Ditto ditto.
"	"	10 A.M.	28.211	70.	73.	740.5	650.	..	..	Calm, overcast.
+23	"	11 "	28.220	69.	75.	..	..	..	..	Clear.
"	"	12 "	28.211	74.	81.	..	..	..	..	Ditto, close.
"	"	1 P.M.	28.198	77.	83.	..	..	..	..	Ditto ditto.
"	"	2 "	28.186	79.	85.	..	..	..	..	Ditto ditto, 110° in sun.
"	"	3 1/4 "	28.165	80.	85.	740.	650.	..	..	Ditto ditto, 100° in ditto.
"	"	10 "	28.247	74.	76.	742.	651.6	..	..	Calm, clear, 100° in ditto.

\* E. Foot of ascent of the Oonnurje Pass.

† Pass between Urgundi and the Meydan Valley.

‡ Bactrian Pillar on the range bounding the Cabul Valley to the S. S. E.

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	Wollast new.	Wollast old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 26	Jelalabad, ..	11 P.M.	28.820	76.	77.	..	..	..	..	Calm, clear, 112° in sun.
"	"	12	28.280	82.	86.	..	..	..	..	Ditto ditto, 120° ditto.
"	"	1	28.248	84.	87.5	742.	649.5	..	..	Ditto ditto, 109° ditto.
"	"	2	28.211	85.	88.5	..	..	..	..	Ditto ditto, 103° ditto.
"	"	3	28.190	84.	88.5	..	..	..	..	Ditto ditto, 92° ditto.
"	"	4	28.170	84.	87.	739.8	648.	..	..	Ditto ditto, 102° ditto.
27	Ali Bajhac,	10½	28.282	76.	82.5	..	651.	..	..	Overcast, calm.
"	"	11	28.270	74.	80.	741.3	..	..	..	Sunshine 96° 5" in sun.
"	"	12	28.248	80.	88.	..	..	..	..	Ditto 110° in ditto.
"	"	1	28.225	82.	86.	..	..	1911	..	Ditto 107° in ditto.
"	"	2	28.200	82.	66.5	..	..	..	..	Clouded, 92° in ditto.
"	"	3	28.190	81.	86.5	..	..	..	..	
"	"	4	28.177	81.	85.	740.8	649.	..	..	Clouded, 90° in ditto.
28	Barikab near	12	28.366	80.	86.	742.5	653.	..	..	Clear, calm, 106° in sun.
"	Charduh, ..	1	28.343	81.	86.3	..	..	..	..	Ditto ditto, 104° in ditto.
"	"	2	28.320	83.	87.	..	..	1822	..	Ditto ditto, 96° in ditto.
"	"	3	28.305	84.	88.	..	..	..	..	Ditto ditto, 98° in ditto.
"	"	4	28.292	82.	88.	..	..	..	..	Ditto ditto, 102° in ditto.
29	Bussola, ..	11½ AM.	28.632	77.	84.	..	..	..	..	Ditto ditto, 105° in ditto.
"	"	12	28.631	77.	84.	..	..	1509	..	Slight earth quake 2½ P.M.
"	"	1 P.M.	28.606	79.	85.	745.	655.5	..	..	Ditto ditto, 108°.
"	"	2	28.596	80.	87.5	..	..	..	..	Ditto ditto, 111°.
30	Lalpore, ..	11½	28.753	80.	81.	..	..	..	..	Calm, clear.
"	"	12	28.753	80.	81.	..	..	..	..	Ditto ditto, 103° in sun.

Date.	Station.	Time.	Barom.	Therm. Attached.	Detached Therm.	Woolst. new.	Woolst. old.	Barom. Height.	Therm. Height.	Remarks.
Oct. 30	Lalpore, ..	1 P.M.	28.735	84.	85.	745.5	656.6	1404	..	Calm, clear, 111° in sun.
"	"	2 "	28.680	86.	87.	..	..	..	..	Ditto ditto, 104° in ditto.
"	"	3 P.M.	28.680	86.	86.5	..	..	..	..	Calm, clear, 108° in sun.
" 31	"	10 A.M.	28.780	76.	73.	745.4	656.6	..	..	Calm, clear.
"	"	11 "	28.750	78.	78.5	..	..	..	..	Ditto ditto.
"	"	12 "	28.738	80.	83.	..	..	..	..	Ditto ditto.
"	"	1 P.M.	28.700	83.	84.5	..	..	..	..	Ditto ditto.
"	"	2 "	28.662	83.	85.	..	..	..	..	Ditto ditto.
"	"	2½ "	28.662	83.	86.	745.5	654.8	..	..	Ditto ditto.
Nov. 1	Landye, ..	11 "	27.697	75.	76.	..	..	..	..	Calm, clear.
"	Khanal, ..	11½ "	27.697	75.	76.	737.	644.6	..	..	[W. wind.
"	"	12 "	27.675	76.	76.	..	..	..	..	Very clear, Therm. 93° in sun
"	"	1 "	27.650	77.	78.	..	..	..	..	Ditto ditto ditto, 95° in do. do.
"	"	2 "	27.606	79.	80.	736.5	644.1	..	..	Ditto ditto ditto, 90° in do. do.
" 2	"	10¼ A.M.	27.670	73.	76.	..	..	2488	..	Calm, very clear.
"	"	11 "	27.662	74.	76.5	..	..	..	..	Ditto ditto, 91°.
"	"	12 "	27.640	77.	80.	..	..	..	..	W. breeze, 90°.
"	"	1 P.M.	27.616	80.	83.	..	..	..	..	Ditto. 84°.
"	"	2 "	27.600	82.	86.	..	..	..	..	Ditto.
"	"	3 "	27.585	85.	86.	..	..	..	..	Ditto.
"	"	8 A.M.	26.725	50.	50.	..	..	3373	..	Calm.
" 3	Summit, ..									
"	Kyber Pass } Ali Musjid, }	2½ P.M.	27.716	76.	78.5	..	..	..	..	Clear light, E. breezes.
"	"	3 "	27.716	78.	80.5	735.	645.3	..	..	Ditto ditto occasionally.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barm. Height.	Therm. Height.	Remarks.
Nov. 3	Kyber Pass Ali Musjid, }	4 P.M.	27.690	76.	75.	..	..	..	..	Cloudy to East.
" 4		5 "	27.690	73.	75.	..	..	..	..	Rather cloudy, E. wind. Ditto ditto ditto.
" "		10½ "	27.720	76.	77.6	736.8	646.	2433	..	
" "		11 "	27.720	78.	81.5	..	..	..	..	Diffused clouds.
" "		12 "	27.706	79.	81.5	..	..	..	..	Ditto ditto.
" "		1 "	27.715	80.	82.5	..	..	..	..	Ditto ditto, calmish.
" "		2 "	27.638	80.	82.5	..	..	..	..	Clear, 99° in sun.
" 5		1½ "	28.482	88.	91.5	743.4	654.2	..	..	Ditto 100° in ditto.
" "		2 "	28.440	88.	91.	..	..	..	..	Ditto 99° in ditto.
" "		3 "	28.440	86.	89.5	743.8	653.3	..	..	Calm, suffused clouds.
" "		10 A.M.	28.937	76.	78.	746.5	657.5	1236.	..	Ditto ditto ditto.
" "		11 "	28.906	74.	77.	..	..	..	..	Ditto ditto ditto.
" "	Peshawur,	1 "	28.893	78.	81.5	..	..	..	..	Ditto ditto ditto.
" "		2 "	28.845	80.	82.	..	..	..	..	Ditto ditto ditto.
" "		3 "	28.869	84.	86.5	746.8	656.5	..	..	Ditto ditto ditto.
" 7		12 "	29.113	82.	86.5	..	..	..	..	Calm, sultry.
" "		1 P.M.	29.042	83.	88.5	..	..	..	..	Ditto ditto.
" "		2 "	29.042	86.	89.	..	..	..	..	Ditto ditto.
" "		3 "	29.028	85.	90.	..	..	..	..	Ditto ditto.
" 8		10 "	29.100	64.	65.	..	..	..	..	Suffused clouds.
" "		1 "	29.080	81.	86.	..	..	..	..	Ditto ditto.
" "		4 "	29.034	83.	88.	..	..	..	..	Overcast.
" 24		12 "	29.102	63.	63.	..	..	..	..	Clouds and sunshine.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wcollast. new.	Wcollast. old.	Barm. Height.	Therm. Height.	Remarks.
Nov. 24	Peshawur,	4 P.M.	29.068	65.	66.	..	..	..	..	Clouds and sunshine.
"	Sunset,	..	29.045	64.	66.	..	..	..	..	Over cast.
"	Midnight,	..	29.016	63.8	64.5	..	..	..	..	Clearish.
25*	Sunrise,	..	29.051	58.	61.	..	..	..	..	Ditto.
"	Noon,	..	29.067	63.	65.	..	..	..	..	Ditto.
"	..	4 "	28.980	65.	66.	..	..	..	..	Fine.
26	..	2 1/4 A.M.	29.084	63.	63.5	..	..	..	..	..
"	..	8 "	29.040	58.	63.5	..	..	..	..	..
"	Noon,	..	29.088	63.5	64.	..	..	..	..	..
"	..	1 1/4 P.M.	29.060	65.	66.	..	..	..	..	Strong E. N. wind.
"	..	2 1/4 "	29.046	68.	67.5	..	..	..	..	..
"	Sunset,	..	29.038	65.	66.	..	..	..	..	Clear, calm.
27	..	1 1/4 A.M.	29.024	62.	63.5	..	..	..	..	..
"	Sunrise,	..	29.030	58.	60.5	..	..	..	..	..
"	Noon,	..	29.080	62.	62.5	..	..	..	..	Clearish.
"	Sunset.	..	29.020	64.	65.	..	..	..	..	Calm.
28	Noon,	..	29.034	62.5	63.	..	..	..	..	Ditto.
"	Sunset,	..	28.940	67.	67.	..	..	..	..	Ditto.
"	Midnight,	..	29.030	63.5	64.	..	..	..	..	Very clear, calm.
29	Sunrise,	..	29.034	57.5	57.	..	..	..	..	Ditto.
"	Noon,	..	29.066	61.	62.	..	..	..	..	Ditto.
"	Sunset.	..	28.958	64.	65.	..	..	..	..	Ditto.

\* Up to this I had only one Thermometer. A second having been procured, the detached Thermometer was customarily placed, about 3 1/2 feet, from the ground, generally on a table; the attached, on the ground near the cistern.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wcollast. new.	Wcollast. old.	Barm. Height.	Therm. Height.	Remarks.
Nov. 29	Midnight,	..	28.960	62.5	63.	..	..	..	..	Very clear, calm.
" 30	Sunrise, ..	..	28.975	57.5	57.	..	..	..	..	Calm, clear.
" "	Noon, ..	..	28.966	62.5	63.5	..	..	..	..	Clear, N. E. wind getting up.
" "	" ..	11½ AM.	28.977	69.	69.5	750.	..	..	..	
" "	Noon, ..	2½ PM.	28.895	62.5	63.5	..	660.5	..	..	
" "	" ..	4 "	28.875	70.5	71.	747.	657.	..	..	
" "	Sunset, ..	..	28.870	67.5	68.	..	..	..	..	Clear, calm. Ditto ditto. Ditto ditto. Clearish.
" "	Midnight, ..	..	28.912	64.	64.	..	..	..	..	
Dec. 1	Sunrise, ..	..	28.915	54.	57.	..	..	..	..	
" "	Noon, ..	..	28.997	61.5	62.	..	..	..	..	
" "	Sunset, ..	..	28.910	64.	65.5	..	..	..	..	Cloudy. Ditto. Ditto. Threatening rain. Clear 51° in air. Ditto 96° ditto. Ditto 92° ditto. Ditto 45° ditto. Ditto 96° ditto.
" 2	Sunrise, ..	..	29.020	53.	56.5	..	..	..	..	
" "	Noon, ..	..	29.039	59.	60.	..	..	..	..	
" "	½ Hour after Sunset, ..	..	29.011	61.	61.5	..	..	..	..	
" 3	Sunrise, ..	..	29.020	55.5	57.5	..	..	..	..	
" "	Noon, ..	..	29.090	58.	59.5	..	..	..	..	
" "	Sunset, ..	..	29.010	60.	61.5	..	..	..	..	
" 4	Sunrise, ..	..	29.095	54.	57.	..	..	..	..	
" "	Noon, ..	..	29.100	59.5	60.	..	..	..	..	
" "	Sunset, ..	..	29.030	61.	62.	..	..	..	..	
" 5	Sunrise, ..	..	29.083	59.	57.	..	..	..	..	
" "	Noon, ..	..	29.075	60.	60.5	..	..	..	..	

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	Wollast. new.	Wollast. old.	Barom. Height.	Therm. Height.	Remarks.
Dec. 5	1 Hour after Sunset, ..	..	28.995	60.	60.5	..	..	..	..	Clear, 67° in air.
"	Midnight ..	..	29.005	60.5	61.	..	..	..	..	Clear, calm, 51° in air.
" 6	Sunrise ..	..	28.960	55.5	57.5	..	..	..	..	Ditto ditto.
"	..	10 A.M.	29.010	59.5	61.	746.	659.	..	..	Ditto ditto 90° ditto.
"	Noon, ..	..	28.958	61.5	63.5	748.3	657.5	..	..	Ditto ditto 90° ditto.
"	..	4 P.M.	28.900	64.	66.	748.3	656.5	..	..	Ditto ditto 71° ditto.
"	Sunset, ..	..	28.887	64.	65.	..	..	..	..	Ditto ditto 71° ditto.
" 7	Peshawur, ..	..	..	..	..	..	..	..	..	Calm clear. Therm. in air 51°.
"	Sunrise, ..	..	28.943	56.	59.	..	..	..	..	Ditto ditto ditto 90°.
"	Noon, ..	..	28.986	60.	61.5	..	..	..	..	Ditto ditto ditto 71°.
"	Sunset, ..	..	28.925	61.5	63.	..	..	..	..	Ditto ditto ditto 46°.
" 8	Sunrise, ..	..	28.942	54.	58.	..	..	..	..	Ditto ditto ditto 56°.
"	Sunset, ..	..	28.890	60.	60.5	..	..	..	..	Ditto ditto ditto 56°.
" 9	..	2 A.M.	28.880	59.5	60.5	..	..	..	..	Rather cloudy, ditto 45°.
"	Sunrise, ..	..	28.920	54.	57.5	..	..	..	..	Ditto ditto 45°.
"	..	10 "	28.966	56.	58.5	747.5	658.5	..	..	Cloudy, ditto 70°.
"	Noon, ..	..	28.966	59.	60.5	747.8	657.8	..	..	Ditto ditto 70°.
"	..	4 P.M.	28.923	61.	62.5	748.	657.6	..	..	Clear, ditto 62°.
"	Sunset, ..	..	28.900	61.	61.5	..	..	..	..	Ditto ditto 45°.
" 10	..	1 1/4 A.M.	28.900	58.5	59.5	..	..	..	..	Ditto ditto 70°.
"	Sunrise, ..	..	28.920	52.	55.5	..	..	..	..	Ditto ditto 45°.
"	Noon, ..	..	28.945	57.	58.	..	..	..	..	Ditto ditto 70°.
"	..	1 1/4 P.M.	28.915	59.	59.5	..	..	..	..	Ditto ditto 70°.



Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Wollast new.	Wollast old.	Barm. Height.	Therm. Height.	Remarks.
Dec. 10	Sunset, ..	..	28.915	59.	59.5	..	..	..	..	Clear, Therm. 59°.
" 11	" ..	12½ PM.	28.958	59.	59.5	..	..	..	..	Clearish, calm, 44°.
" "	Sunrise, ..	..	28.990	50.	53.	..	..	..	..	Ditto ditto 95°.
" "	Noon, ..	..	29.032	57.5	58.	..	..	..	..	Ditto ditto 59°.
" "	Sunset, ..	..	28.990	59.	59.5	..	..	..	..	Clear and calmish.
1840.										Ditto ditto.
Jan. 12	Shaiwa, ..	1 P.M.	28.235	61.	69.	..	..	..	..	Very cloudy.
" "	" ..	8 "	28.211	62.	72.	..	..	..	..	Cloudy.
" "	Pushut, ..	2 "	27.620	50.	51.	..	..	..	..	Moderate N.E. wind, very fine.
" "	Camp, ..	4 "	27.610	49.	51.	..	..	..	..	Very fine, calmish.
" 30	Pushut Fort, ..	10 A.M.	27.544	49.	51.	..	..	..	..	Ditto ditto.
Feb. 2	" ..	10 "	27.617	46.5	48.5	..	..	..	..	Ditto ditto.
" "	" ..	12 "	27.613	55.	56.5	..	..	..	..	Cloudy.
" "	" ..	1 P.M.	27.607	57.	58.5	..	..	..	..	Ditto.
" "	" ..	4 "	27.568	57.	58.5	..	..	..	..	Partial clouds.
March "	Chughan, ..	6½ A.M.	27.417	57.	57.	..	..	..	..	
" "	Paicen, ..	7½ "	27.420	57.	57.	..	..	..	..	
" 3	Chughur, ..	2½ PM.	27.258	65.	..	..	..	..	..	
" "	Bala or	4 "	27.245	67.5	..	..	..	..	..	
" 4	Olipore, ..	10 A.M.	27.258	61.5	..	..	..	..	..	
" "	" ..	11 "	27.255	62.5.	..	..	..	..	..	
" "	" ..	12 "	27.245	63.	64.5	..	..	..	..	
" 9	Loongurrie, ..	1 P.M.	24.758	85.	..	..	..	..	..	Fine.
" 29	Koonur, ..	9 A.M.	27.800	58.5	..	..	..	..	..	Fine and clear.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woolast. new.	Woolast. old.	Barm. Height.	Therm. Height.	Remarks.
1840.										
March 29	Koonur. . .	10 A.M.	27.795	60.	.	.	.	.	.	Fine and clear.
"	"	11 "	27.795	61.	.	.	.	.	.	Ditto ditto.
April 12*	Bharowul, . .	9 "	24.578	58.5	.	.	.	.	.	Cloudyish.
"	"	9½ "	24.577	57.7	.	.	.	.	.	
June 22	Khujiak, . .	10 "	25.472	89.	93.	.	.	.	.	Hazy.
"	"	12 "	25.431	91.	95.	.	.	.	.	Calm, sultry.
"	"	1 "	25.418	94.	99.	.	.	.	.	Clear, slight N. E. breeze.
"	"	4 "	25.530	95.	98.	.	.	.	.	
1841.										
Aug. 26†	Koh-i-Baba,	1½ PM.	17.356	79.5	85.	.	.	.	.	W. E. W. breezes, clear.
"	"	2 "	17.354	79.5	85.	.	.	.	.	Ditto ditto.
"	Lower Sta- tion, . .	4 "	18.889	63.	68.	.	.	.	.	Ditto ditto.
"	Kulsoo, . .	6 20'	20.716	58.5	60.	.	.	.	.	Ditto ditto.
Sept. 13†	Akrobat, . .	1½ "	20.970	72.	73.5	.	.	.	.	Strong W. wind, very clear.
"	"	2 "	20.972	72.	73.5	.	.	.	.	

\* A village to the W. of Olipore on the mountains, and near Bharowul, both being about the inferior limit of the Deodar.

† These observations are for the height of the Eastern end of Koh-i Baba; the peaks were estimated (by the eye) as 1000 or 1500 feet above the upper station. All the Observations were made in the open air and in sunshine: the attached Thermometer placed inside the cistern, the detached hung five feet from the ground.

Date.	Time.	Bar.	Attached Therm.	Detached Therm.	Wet bulb.	Remarks.
Dec. 21	7 A. M.	29.044	52.	54.5	50.	Calm, clearish, Therm. in open air, 45°
"	8 "	29.056	46.	50.	46.5	Ditto ditto, room opened ditto ditto, 48°
"	9 "	29.078	47.	50.5	46.5	Ditto ditto, 67.6
"	10 "	29.100	48.	50.	46.5	Ditto ditto, 79.5
"	11 "	29.080	51.	52.5	49.	Ditto ditto, 81.5
"	12 "	29.071	53.	53.5	49.	Ditto ditto, 87.
"	1 P. M.	29.060	54.	55.5	51.	Ditto ditto, 85.5
"	2 "	29.054	55.5	56.5	51.	Ditto ditto, 80.5
"	3 "	29.047	55.5	56.5	52.5	Ditto ditto, 75°
"	4 "	29.037	56.5	57.	52.5	Ditto ditto.
"	5 "	29.030	56.	57.5	53.	Ditto ditto, 62°
"	6 "	29.030	56.	57.5	53.	Ditto ditto, 62°
"	7 "	29.022	55.	56.	52.	Ditto ditto, bright moon light, 57°
"	8 "	29.030	55.	56.	52.	Ditto ditto, 55°
"	9 "	29.028	55.	56.5	52.	Ditto ditto.
"	10 "	29.030	54.5	56.5	52.	Ditto ditto.
"	12 "	29.015	54.	55.5	51.	Ditto ditto, 44.5
"	1 A. M.	29.018	54.	55.5	51.	Ditto surface of Mercury very flat.
22	2 "	29.000	53.5	55.5	51.	Ditto.
"	3 "	29.000	53.5	55.5	51.	Ditto.
"	4 "	29.000	53.5	55.5	51.	Ditto.
"	5 "	29.000	53.	53.5	50.	Ditto.
"	6 1/4 "	28.992	51.	54.	49.5	Ditto room opened, 85°

Date.	Time.	Bar.	Attached Therm.	Detached Therm.	Wet bulb.	Remarks.
Dec. 22	8 A. M.	29.980	44.	49.5	45.5	Calm, room opened, .. .. 85°
"	9	29.020	47.	50.5	46.	Ditto surface very convex.
"	10	29.030	49.	52.5	49.	Ditto. .. .. 68°
"	11	29.025	52.	52.5	49.	Ditto. .. ..
"	12	29.007	53.	54.5	51.	Ditto. .. .. 83°
"	1 P. M.	29.000	54.	56.5	53.	Ditto. .. ..
"	2	28.986	55.5	57.	53.	Ditto. .. ..
"	3	28.960	56.	58.	53.	Ditto. .. ..
"	4	28.955	57.	59.	54.	Ditto. .. ..
"	5	28.955	56.5	59.	54.	Ditto. .. .. 62°

Throughout no change in aspect of sky, uniformly clear above, more or less hazy round the horizon, slightly 10 to S.S.S.E., S.W., very much so along Snowy Range or to W. N. W. to N. E.

The room had one door open, and that to the westward; it opened into a spacious verandah; throughout the night it was shut.

The instruments were placed almost opposite the door. The Detached Thermometer hung from the wall 3½ feet from the floor. The attached Thermometer was placed in the Cistern.

The wet bulb was an ordinary coarse Thermometer, divisions of 2° each: metal scale; *bulb not naked*.

The Thermometer in the open air was an indifferent one, it was hung upon the top of the house, 4 feet from its terraced roof.

The time was ascertained on the 21 by altitudes of the Sun, and on the 22 by equal altitudes. The time was given in the Nautical Almanack.

CANDAHAR.

Observations of the Wet and Dry Bulb Thermometers.

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
1840.				
May 22	10 A. M.	76.5	62.	Clear.
" "	11 "	76.5	62.	Southerly wind.
" "	12 "	78.	62.	Moderate.
" "	1½ P. M.	79.½	62.	Ditto.
" 23	10 A. M.	75.	59.5	Clear, moderate.
" "	11 "	76.5	59.5	Southerly wind.
" "	12 "	79.5	59.5	Ditto.
" "	1 P. M.	81.	59.5	Ditto.
" "	2 "	82.	59.5	Ditto.
" "	4 "	82.	59.5	Ditto.
" "	6 "	82.	59.5	Ditto.
" 24	8 A. M.	74.5	60.	Calm, clear.
" "	10 "	76.	59.5	Ditto.
" "	12 "	80.8	59.5	Ditto.
" "	1 P. M.	81.	59.5	Ditto.
" "	2½ "	81.5	59.5	Ditto.
" "	3½ "	82.3	59.5	Ditto.
" "	6½ "	82.5	59.8	Ditto.
" 25	9 A. M.	76.5	60.	Ditto.
" "	10½ "	79.5	58.8	Ditto.
" "	12 "	81.	58.7	Ditto.
" "	1 P. M.	82.5	59.	Ditto.
" "	3 "	84.	59.	Ditto.
" "	8 "	84.	59.	Ditto.
" 26	9 A. M.	78.	59.8	Ditto.
" "	10½ "	80.5	59.	Ditto.
" "	12 "	82.8	59.5	Ditto.
" "	1½ P. M.	85.	59.8	Ditto.
" "	3 "	85.5	59.8	Ditto.
" 27	9 A. M.	81.	61.8	Westerly wind occasionally,
" "	11 "	83.	60.	strong.
" "	12 "	84.	60.3	
" "	3½ P. M.	86.5	61.	
" "	7 "	86.	61.	
June. 6	7 A. M.	81.	66.	Usual.
" "	10 "	84.	64.5	W. wind beginning 9 A. M.,
" "	11 "	85.	65.	occasional very hot, with
" "	12 "	86.	65.	clouds of dust, blown from
" "	1 P. M.	87.	64.8	the desert.
" "	2 "	87.8	64.5	
" "	3 "	88.	64.5	

## CANDAHAR.

## Observations of the Wet and Dry Bulb Thermometers.—(continued.)

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
June 6	4 P. M.	88.5	64.5	
" "	6 "	88.5	64.5	
" 7	9 A. M.	81.5	63.	Ordinary weather, occasional calms, but generally strong.
" "	10 "	83.5	64.	
" "	11 "	85.5	64.5	
" "	12 "	86.5	64.5	W. winds.
" "	2 P. M.	88.5	64.5	
" "	3 "	88.5	64.5	
" "	4 "	88.5	64.5	Ditto ditto.
" "	5½ "	88.5	64.5	
" "	6½ "	88.5	64.5	
" 8	9 A. M.	83.5	62.5	Ordinary weather.
" "	10 "	84.5	62.8	Ditto ditto.
" "	2 P. M.	90.5	64.3	Ditto ditto.
" 9	10 A. M.	88.5	69.5	Ditto ditto.
" "	12 "	90.	66.5	Ditto ditto.
" "	2 P. M.	90.5	66.5	Ditto ditto.
" 12	10 A. M.	83.	64.5	
" "	12 "	86.5	65.	Calm and clear.
" "	1 "	88.	64.7	W. wind from 11 A. M. occasionally strong.
" "	3 P. M.	88.8	64.8	
" "	4 "	88.	64.5	
" "	5 "	88.	64.5	
" "	6½ "	87.	64.5	
" 13	9 A. M.	84.8	63.5	W. wind.
" "	10 "	85.5	63.8	Ditto strong cloudy.
" "	11 "	86.5	65.	Moderate.
" "	12 "	87.5	64.	
" "	2 P. M.	88.5	64.8	Calm.
" "	3 "	89.3	65.	W. wind, cloudy.
" "	4 "	90.	65.5	Ditto ditto.
" "	6 "	89.8	66.	Ditto ditto.
" 16	9 A. M.	81.	63.	
" "	10 "	82.3	63.5	Calm clear.
" "	11 "	84.	63.5	Ditto.
" "	12 "	84.5	63.5	Slight W. wind.
" "	2 P. M.	85.5	63.5	W. wind.
" "	3 "	86.5	63.5	Ditto.
" "	4 "	86.8	63.5	Ditto.
" "	5 "	87.	63.5	Ditto.
" "	6½ "	87.	64.	Ditto hazy.

## CANDAHAR.

*Observations of the Wet and Dry Bulb Thermometers.—(continued.)*

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
June 17	9 A. M.	78.	63.5	
" "	10 "	83.	64.	
" "	11 "	84.	64.	Calm clear.
" "	12 "	86.	63.8	
" "	1 P. M.	86.5	64.	Very slight.
" "	3 "	87.5	64.5	W. wind.
" "	4 "	87.5	64.5	
" "	5 "	87.5	64.5	
" "	6½ "	88.	64.5	
" 18	9 A. M.	85.	64.5	Calm.
" "	10 "	86.5	66.5	Calm, sultry.
" "	11 "	88.	67.	Ditto ditto.
" "	2 P. M.	90.	68.	Ditto ditto.
" "	3 "	90.	67.5	Ditto ditto.
" "	4½ "	91.	68.	Ditto ditto.
" "	6 "	91.	68.8	Ditto ditto.
" "	6½ "	90.5	68.8	Ditto ditto.
" 19	9 A. M.	87.5	68.5	Ditto clear.
" "	10 "	89.	69.5	Ditto ditto.
" "	11 "	91.5	69.5	Ditto ditto.
" "	12 "	92.	69.	Ditto ditto.
" "	1 P. M.	92.	68.5	Ditto ditto.
" "	2 "	93.	68.8	Ditto ditto.
" "	3 "	93.	69.	Gusts of W. wind.
" "	4 "	93.	69.	Slight W. wind.
" "	5 "	92.5	69.	Hot W. wind.
" 20	9 A. M.	87.	68.5	Calm.
" "	10 "	88.	68.5	Ditto.
" "	11 "	91.3	68.5	Ditto.
" "	12 "	91.5	68.8	Ditto.
" "	2 P. M.	93.	68.5	Hot W. wind moderate.
" "	4½ "	94.5	69.	
" "	5½ "	95.	69.8	Ditto gusts.
" "	6½ "	93.8	70.	Ditto ditto.
" 21	8 A. M.	87.	69.	Calm.
" "	9 "	88.5	70.	W. wind.
" "	10 "	89.3	70.5	Ditto.
" "	11 "	88.5	75.	Ditto.
" "	12 "	88.5	72.	Ditto.
" "	1 P. M.	90.5	75.	Ditto.

## CANDAHAR.

*Observations of the Wet and Dry Bulb Thermometers.—(continued.)*

Date.	Time.	Dry bulb.	Wet bulb.	Remarks.
June 21	3 P. M.	90.5	70.5	Calm.
" "	4 "	91.	70.	Ditto.
" "	6 $\frac{1}{2}$ "	91.5	70.	Ditto.
" 22	9 $\frac{1}{2}$ A. M.	89.5	70.	Ditto.
" "	10 "	90.5	70.	Ditto.
" "	11 "	92.0	70.	Ditto.
" "	12 "	92.5	70.5	Slight W. breezes.
" "	1 P. M.	92.8	70.5	Ditto ditto.
" "	2 "	92.8	70.5	Ditto ditto.
" "	3 "	93.	70.5	Ditto ditto.
" "	4 "	93.	70.5	Ditto ditto.
" "	5 "	92.8	70.3	Ditto ditto.
" "	6 "	93.	70.5	Ditto ditto.
" "	6 $\frac{1}{2}$ "	93.	70.5	Ditto calm, night.
" 23	8 A. M.	87.	68.5	Calm.
" "	9 "	87.5	68.5	Ditto.
" "	10 "	89.	68.	Ditto.
" "	11 "	91.	69.	Ditto.
" "	12 "	91.	69.	Ditto.
" "	1 P. M.	91.	69.	Ditto.
" "	2 $\frac{1}{2}$ "	92.5	69.	Ditto.
" "	4 "	93.	68.5	Slight W. wind.
" "	6 "	92.8	69.	Ditto.
" 24	8 $\frac{1}{2}$ A. M.	88.5	68.5	Calm, sultry.
" "	10 "	89.5	68.8	
" "	11 "	92.8	68.	Violent W. wind.
" "	12 "	92.5	68.8	
" "	1 P. M.	93.3	68.5	Calm.
" "	2 "	93.5	68.5	N. E. wind.
" "	3 "	95.	68.	Ditto.
" 25	9 A. M.	90.3	..	Calm.
" "	10 "	91.	..	
" "	12 "	92.3	..	
" "	2 P. M.	94.	..	W. wind.
" "	5 "	94.5	..	Ditto.

These observations were made in a largish mosque, with one small door to the Eastward, and several grated windows in the same direction, which were blocked up with jousa, and watered occasionally. The prevailing winds are Westward, so that the Thermometers were not exposed to their direct influence.

The wet bulb was a standard given me by the late J. Prinsep Esq. with an ivory scale and naked bulb divisions.

The dry one was a good Thermometer with an ivory scale, divisions 13 each belonging to Major Thomson, C. B.



*Proceedings of the Asiatic Society.**(Friday the 21st January, 1842.)*

A Meeting of the Society was held at its Rooms, at the usual hour, on Friday the 21st January, in consequence of an adjournment from a previous Meeting, on which evening a sufficient number of Members to proceed upon the important business before the Society was not present.

The following letter, conveying the resignation of the Honorable Sir EDWARD RYAN, as President of the Society, was read :—

*Court House, December 20, 1841.*

SIR,—I regret to find that it will not be in my power to attend the next Meeting of the Society, and I must therefore beg of you to tender for me my resignation of the office of President.

I cannot quit a Society on which I have so long presided, without expressing my deep sense of the uniform kindness and consideration with which the Members have been pleased to regard my humble efforts to discharge the duties of an office, which, if I had properly weighed my own qualifications, I ought perhaps never to have accepted.

It is highly gratifying to me to know, that however unworthily your chair may have been filled, by the exertions of your most able and excellent Secretaries the Society, during the last nine years, has greatly extended the reputation which it early attained amongst the learned Societies of Europe, under the auspices of its Eminent Founder.

I have the honor to be,

Sir,

Your obedient humble servant,

EDWARD RYAN.

To HENRY TORRENS Esq.

*Secretary to the Asiatic Society.*

The Honorable H. T. PRINSEP stated, that as this letter had been referred to the Committee of Papers, it had been deemed proper to convene a special meeting of that body, at which it was determined that the following resolutions be proposed to the Society for adoption at their present meeting :—

Read the resignation by the Honorable Sir E. RYAN, of the Chair of the Society.

Submitted by the Honorable H. T. PRINSEP, Esq. and seconded by the Honorable Sir J. P. GRANT—That it seems to the Committee advisable, that the late President be requested to sit for his picture in England, to any eminent artist whom he may select as fitting for the purpose. The size of the picture to be Kitcat, in order to correspond with the pictures of the other eminent men, as Sir W. JONES, Lord WELLESLEY, Lord MINTO, &c. &c. already in possession of the Society.

Resolved—That this proposition be recommended for adoption to the Society, as a proper mode of recording the sense entertained by that body, of the value of Sir EDWARD RYAN's long and able services in the Chair, and the interest with which he has always regarded its proceedings in all branches of Science.

Proposed by the Honorable W. W. BIRD, Esq. and seconded by the Honorable Sir J. P. GRANT, that the Honorable H. T. PRINSEP, Esq. be recommended to the Society as a Member highly qualified by his high general attainments, and his known zeal in the pursuits of Oriental literature, as well as by his long standing in the Society, to take the Chair vacated by the Honorable Sir EDWARD RYAN.

Resolved—That the proposition be submitted accordingly.

H. TORRENS,

*Secretary to the Asiatic Society.*

The adoption of the first of these resolutions was then proposed by the Honorable H. T. PRINSEP, seconded by the Secretary, and carried unanimously.

The Honorable W. W. BIRD then rose, and after a just eulogy on Mr. H. T. PRINSEP's merits as an Oriental and general scholar, and as a most zealous and industrious member of the Society, with many feeling allusions to the transcendent merits of Mr. JAMES PRINSEP, a name so justly dear to the Society as that from whose labours alone have raised its fame so far above what it had ever before attained—Proposed in continuation, "That the Honorable H. T. PRINSEP be requested to accept of the office of President of the Asiatic Society."

The Right Reverend the LORD BISHOP, in rising to second this motion, paid a warm and a just tribute to the zeal and interest so constantly shewn in every matter relative to the Society's pursuits and affairs by its late President, the Honorable Sir EDWARD RYAN. His Lordship then addressing himself to Mr. PRINSEP as the future President of the Society, adverted to the Discourses of its founder, Sir WILLIAM JONES, as compositions well worthy of the close attention of its Presidents, from their enlarged views, and their general tendency to raise the character of its pursuits, and to render it, as it always had been, both in India and in Europe, the just and fruitful parent of Oriental learning and science. His Lordship also adverted in feeling language to the merits of the late Mr. JAMES PRINSEP, observing, that no one individual could do justice to them.

The motion was carried by acclamation.

The Honorable H. T. PRINSEP, on taking the chair, and returning thanks for the honour conferred upon him by the Society, said, that he felt he owed much more to the labours of his brother, than to any merits of his own: that he felt and knew that his heavy official duties during many years had left him far less leisure than he could have desired for the prosecution of his Oriental and other studies, and that he had thus been unable to do much, which he feared may have been expected from him.

He feared also, that it might now, with the scanty leisure he could still command, be too late to repair this, and to regain lost time, and that he could only thus promise zeal and devotion to the pursuits and interests of the Society, and express his earnest desire to tread in the footsteps of his lamented brother. He looked to, and fully trusted in much assistance from the labours of individual Members, and in the support which he should receive from the Society in the election of its Officers for the advancement of its interests and of its good name.

E. B. RYAN, Esq. was proposed as a Member of the Society, by H. TORRENS, Esq. and seconded by

A letter was read from DR. HÆBERLIN, reminding the Secretary that his proposition to elect DR. EWALD an Honorary Member of the Society, was yet before it.

DR. EWALD was unanimously elected.

The Secretary brought to the notice of the Society, that the Collection sent out by the Honourable the Court of Directors, as a basis for an Indian Museum of Economic Geology, had been made over to it, and arranged in a separate room appropriated to its objects; but that the extensive duties which the superintendence of a Museum of this nature would require, to carry out fully, and efficiently its great objects, the development of the whole inorganic products of India, were such, that it would require the attention of an individual. He stated, that it was well known by letters from home,

that the Court of Directors had authorised the Government to incur the expence of the nomination of a person charged to carry out their views, and that it might thus not be improper, were the Society to address Government on the subject. It was agreed that this matter should be left to the Committee of Papers.

The following Books, &c. were presented, and the thanks of the Society recorded for them :—

*List of Books received for the Library of the Asiatic Society, for the Meeting on the 21st January, 1842.*

- Lane's Dictionary, English and Burmese. Calcutta, 1841, (3 copies).  
 Journal of the Bombay Branch Society. No. 2, October 1841, pamphlet.  
 The Calcutta Christian Observer. January, 1842, No 25, ditto.  
 The Oriental Christian Spectator. November 1841, Bombay, vol. 2d, No. 11, second series, ditto.  
 Society for the Encouragement of Arts, Manufactures, and Commerce. Premiums for the Sessions 1840-41, 1841-42. London, 1840, six copies, ditto.  
 Transactions of the Society for the Encouragement of Arts, &c. during the Sessions 1839-40, vol. 58d, part 1.  
 London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 3d series, vol. 19, No. 122, August 1841, London, pamphlet.  
 Proceedings of the London Electrical Society, Sessions 1841-42, London, ditto.  
 Transactions of the Geological Society of London, 2d series, vol. 6th, part 1st, 1841, ditto.  
 Journal des Savans. Mai, 1841. Paris.  
 Kittoe's Illustrations of Indian Architecture from the Mohammedan Conquest downwards. 1838, Nos. 1 to 12 and 21 Plates, equal to 5 Numbers. One plate over.  
 The Silurian System, from the Edinburgh Review, April 1841, No. 147.  
 Yarrell's History of British Birds. London, part 27th.  
 Some Account of the General and Medical Topography of Ajmeer, by R. H. Irvine. Calcutta, 1841.  
 Di un Vaso Greco Dipinto che si conserva nel real Museo Borbonico Discorso del Cavalier Bernardo Quaranta. Pamphlet.  
 Sulla figura e L'Iscrizione egizia in cise in uno Smeraldo Quaranta. Napoli, 1826 ditto.  
 Nafhatul Yaman, a collection of pleasing stories and compositions, both in prose and verse. Hooghly, 1841.  
 Diwani Mootanabee. Hooghly, 1841.  
 Callery. Systema Phoneticum Scripturae Sinecae, pars prima et secunda. Macao, 1841.  
 Proceedings of the American Philosophical Society. 1841, vol. 2d, part 17th, pamphlet.  
 Icones Plantarum Indis Orientalis, by R. Wight. Vol. 2d, part 8d, ditto.  
 Transactions of the London Electric Society, from 1837 to 1840, London, 1841.  
 Spry's Plants, &c. required for India. Calcutta, 1841, (5 copies).  
 Masnabee-Kanoor, in Oordoo.  
 Naphasil-Logawd, in Persian.

An extract of a letter from DR. JAMISON to MR. CLERK, Political Agent, N. W. Frontier, dated Camp Kalabagh on the Indus, Nov. 15, 1841, was partly read. From this it would appear, that with reference to the main objects of DR. JAMISON's mission, the discovery of good sources for a supply of Coal, there was not from the Geological character of the country, much chance of its attainment. Coal it is true, was found at Kalabagh in thin seams in a white sand-stone, which alternates with the red marls in which the rock salt and gypsum are imbedded, the largest seam being about 17 inches in breadth, consisting partly of coal, sand-stone, and mineral sulphur. About 2,000 maunds had been collected, but an exorbitant price, Rs. 4 per pukka maund, was demanded, as the people used it for medicine.

The oldest rock met with between Jabalpure and Kalabagh, is magnesian limestone, on which is the red sand-stone and red marl, and white sand-stone alternating with it.

In a lime-stone filled with organic remains, (probably the equivalent of the muschelkalk of Germany,) iron ores, red and brown hematite, occur in enormous beds. On the banks of the river, the sand is extensively washed for gold, so that we have here at once, iron, gold, sulphur, salt, gypsum, lime-stone, saltpetre, alum, and coal; all that is wanting to raise the town (Kalabagh) to one of the most important cities in India, being coal in quantity, with enterprise and capital; but DR. JAMISON concludes, from the geological characters of the district, that no coal worth working will be found in it. The coal met with is partly lignite and partly jet, and not true bituminous coal; but from experiment it seems well adapted for Steam Vessels, burning with a good flame, and having but little residuum.

This valuable paper was referred to the Secretary, for publication in his Journal.

A letter and statement from Captain BAYLE, Superintendent Experimental Cotton Plantations, contradicting many points in the letter of Mr. BRUCE was presented. Referred to the Editor of the Journal.

A letter from Prince SOLTIKOFF, requesting permission to have copies made of those parts of the Mackenzie MSS. relating to Sculpture and Architecture.

Letter from the Secretary to Government in the General Department was read, forwarding copy of a circular from the Military Board to the Engineer and other officers employed on the construction of roads, recommending to their attention, as suggested by Mr. Acting Curator PIDDINGTON, the objects of the Museum of Economic Geology, and forwarding to them copies of Captain TARMENHERRER's paper. A box of tin and manganese ores from Mergui had also been sent by the Military Board, and these were accompanied by a report from the Secretary to the Coal and Iron Committee. Referred to the Journal.

A letter from Brigadier TWEMLOW, received through the Agricultural Society, with some specimens, was also referred to the Editor of the Journal for publication.

One from Dr. H. H. SPRAY, forwarding specimens of copper ore from Cornwall, presented by Major JENKINS, for the Museum of Economic Geology.

From Captain KITTOE, with numbers completing a full copy of his valuable work on Indian Architecture, and offering his best services to the Society in Europe.

From Colonel POGSON, requesting that the Society would republish in its Transactions, a paper published by Dr. CORBYN in his Journal, and forwarding a MSS. in continuation. Referred to the Committee of Papers.

The report of the Curator to the Society was read as follows :—

### *Animal Kingdom.*

#### MAMMALIA.

In this class of animals, I have the satisfaction to record the following donations :—

1st. A collection of numerous skeletons, in pieces, some extra skulls, frontlets and horns, and a few skins, together with specimens of other classes, from Mr. W. Masters: the former being referrible to the following species :—

*Hylobates*, apparently *H. Hoolock*, Harlan: a skull, older than those previously in the Museum, and cutting its third upper and second lower true molars, the third lower being also partly visible in process of formation.

*Semnopithecus Entellus*: the skeleton of a very fine old male, being a welcome acquisition to our collection.

*Macacus*, apparently *M. Rhesus*: a skeleton.

*Lemur*, qy. species? : ditto.

*Pteropus Edwardsii*: ditto.

*Megaderma Lyra*: ditto.

*Scotophilus castaneus*: ditto. As the skulls of these three Bats have been minutely compared with other specimens in the Museum, prepared under my own direction, there can be little doubt of the correctness of their identification.

*Falpes Corsac* (vel *Bengalensis*, *Indicus*, *Kokree*, &c. Auctorum): a skull.

*Felis Tigris*: the skeleton of a fine male; with four additional skulls, apparently of one male and three females; and a skin in bad condition of a very large Tiger. Our Bengal Museum was perhaps the only one in the world, of proportionate extent, that did not previously contain a skin of this renowned Bengal animal. A fine specimen for stuffing is still a desideratum, which I hope this notice will be the means of obtaining.

*F. Pardus* (vel *Leopardus*): a skull, and much injured skin.

*Lutra leptonyx*: a stuffed specimen, being a species and genus new to the Museum, though one of four species which have been obtained since our last meeting.

*Ursus labiatus*: a skull.

*Talpa Europea*: a stuffed specimen. Of this genus I may remark that our Museum contains a perfect specimen in spirits, from Sylhet (vide *J. A. S.* vii. 464), of the species inhabiting northern India (*T. micrura*, Hodgson); also an imperfect skin, of decidedly the same species, from Assam (noticed in *J. A. S.* vii. 464); and a skeleton, which I believe is also that of a specimen from the latter country. This animal, according to Mr. Hodgson (*Proc. Zool. Soc.*, 1834, 96), is, in Nepal, found only in the Kachar or northern region; it (or a species of Mole, in all probability the same,) is mentioned by Mr. Traill as an inhabitant of Kumaon (*As. Res.* xvi. 153); and the Hon. Mountstuart Elphinstone, in his volume on Kabul (p. 142), observes, that "Moles are only found in Kashmir". Lieut. Hutton states the existence of a Mole at Quetta (*Calc. Journ. Nat. Hist.* No. IV, 558). There can be little doubt that all these notices refer to the same species, which will probably prove to have a still more extensive range, especially to the eastward. As many as four species of true *Talpa* have now been ascertained, all of which are inhabitants of the continent

of Europe and Asia, one, however, being found in Japan. In Africa, at least South Africa, they are represented by the genus *Chrysochloris*, and in North America by *Scalops* and *Condylura*; in South America no *Insectivora* (Cuv.) have hitherto been discovered (for the *Sorex tristriatus* of Fischer has proved to be a genuine *Opossum*) and Mr. Waterhouse has well remarked that their place is there supplied by the numerous small Opossums, as in Australia by other analogous *Marsupialia*. There exists, however, a species of true *Insectivora* (Cuv.) in the island of St. Domingo, which constitutes the genus *Solenodon* of Brandt. No burrowing forms that can be considered analogous to the Mole and allied genera have as yet been discovered among the *Marsupialia*, but it is highly probable that such will eventually be found to exist.

*Equus Caballus* : a skull.

*Elaphus Indicus* : some molar teeth.

*Cervus Hippelaphus* : frontlet of a young animal.

*C. Axis* : skulls of an old male, a young male, and a female.

*C. porcinus* : a frontlet.

„ allied to *porcinus* : a pair of loose antlers.

„ *muntjac* : a frontlet.

*Antelope Cervicapra* : an imperfect skull, a pair of loose horns, and an odd horn.

*Ovis Nahoar* : horn of a female.

„ *Aries*, var : a skull.

*Mus decumanus* : a skeleton, and a stuffed specimen.

*Cavia cobaya* : a stuffed specimen.

*Manis pentadactyla* : ditto.

2d. I have to announce the present, from “a lady,” of a living female of the *Moschus Meminna*, Auctorum; this species I had never previously seen alive (as I often have its Malayan congeners), and certainly did not expect to find it so very bulky an animal, or in other respects so nearly allied to the recently discovered true Chevrotain of Western Africa (*M. aquaticus*, Ogilby, *P. Z. S.*, 1840, 35), a species which I had the good fortune to examine, or, in common, I imagine, with every other zoologist who has heard the announcement of a Chevrotain from that locality, I should certainly have been unable to resist the suspicion that the animal would rather have belonged to the Philantombah group of “Antelopes” (*Cephalophus*), or perhaps some allied form; it is, however, in all respects a thorough Chevrotain, nearly allied to the *Meminna*, and the first Cervine quadruped (with the exception of that very remarkable one, the Giraffe,) which has been discovered to the southward of the Atlas chain in all Africa: \* its habits are remarkably aquatic, which circumstances I mention

\* I say *Cervine*, because quite unable to appreciate any sufficient difference between the *Cervidae* and *Moschidae*, Auctorum, to justify their current separation into groups of the value of “families.” How, for instance, can the Muntjacs be placed in a distinct family division from the Chevrotains? With respect to the presence or absence of antlers, which is the only positive distinction subsisting between these two alleged families, it is well known that a South American group of tiny Deer have the appendages in question reduced to the permanent condition of *brockets*, or small branchless beams, to say nothing of the fact of their constant absence in one sex all but throughout the family; while, on the other hand, it is by no means clear, now especially that a plurality of species has been ascertained among the musk-bearing *Moschi*, that one or more of these is not actually furnished with antlers: witness the description of the musk-animal by the Arab historian, Abusseid Serafi, who (as cited

in the hope of inducing some investigation as to whether the Indian species may not participate in the same propensity; nothing of the sort (that I am aware) has hitherto been observed, or at least published, concerning it, nor from the skulking habits of the animal does it appear to have been much noticed in many districts where it is certainly found. In Ceylon, it is as common as Hares are in England; the natives trap great numbers of them in the interior of the island, and bring them almost daily to market in Colombo and other towns, where they sell for about a rupee each, and are esteemed very delicate-eating. In Colonel Sykes's list of the Mammalia of the Dukhun (P. Z. S. 1831, 104), it is mentioned that "considerable numbers exist in the dense woods of the Western Ghauts, but they are never found on the plain." Mr. Walter Elliot, in his 'Catalogue of Mammalia in the Southern Mahratta Country' (*Madras Journal*, No. xxv. 220), notices it as "common in the forest, and even occasionally

by Mr. Ogilby) states that "it is very similar to the Roe, *having long projecting tusks, and horns of a straight form or slightly pushed back*;" so, also, in Bell's *Travels in Tartary* (i, 224), we read that—"The *Kabenda* is a size less than the Fallow Deer, and its colour dark. It is of a pretty shape, having *erect horns without branches*; is very swift, and haunts rocks and mountains of difficult access to men and dogs; and, when hunted, it jumps from cliff to cliff with incredible celerity and firmness of foot. The flesh is esteemed better venison than any of the Deer kind of larger size, *of which there is a great variety in these parts* [neighbourhood of Elimsy.] *This is the animal from which the drug called musk is taken* \* \* \*. There are many of them in this country, but the musk is not so strongly scented as that which comes from China. The General had bred this creature to be very familiar. He fed it at his table, with bread and roots; when dinner was over, it jumped on the table, and picked up the crumbs. It was pleasing to observe its gambols, playing with the children like a kid." With such opportunities, accordingly, for observation, it is very unlikely that the traveller should be mistaken in what he avers concerning its "horns."

I may remark here, that in an account of the anatomy of a "*cis-Himalayan*" Musk, by A. Campbell, Esq. published in *Jour. As. Soc.* vi., 119, the presence of a gall bladder is noted, "of an oval shape, pendulous from the right half of the liver, and three inches long, by two inches and a half in diameter." Whether this viscous was found to exist by Professor Pallas, who furnishes an account of the anatomy of (I believe) a Tartarian specimen, I do not remember to have noticed, and have not now the work to refer to: the Chevrotains have none; and the existence or non-existence of a gall-bladder has generally been considered as an invariable distinction between the two great divisions of hoofed ruminants, being absent in the Cervine group; hence its occurrence in a true *Moschus* is remarkable, but it is well to quote the following from Professor Owen's elaborate description of the internal conformation of the Giraffe (*Trans. Zool. Soc.* ii. 227-8.)

"As the presence of a gall-bladder distinguishes the hollow-horned from the solid-horned ruminants, the investigation of this point in the anatomy of the Giraffe was attended with much interest; and the result of an examination of three individuals shews how necessary it is not to generalize on such a point from a single dissection.

"In the first Giraffe, (a female,) I found a large gall-bladder, which presented an unusual structure, being bifid at its fundus \* \* \*. In the two males afterwards examined, there was not a vestige of a gall-bladder, but the bile was conveyed by a rather wide hepatic duct to the duodenum. I conclude, therefore, that the absence of a gall-bladder is the rule, or normal condition; and that the Giraffe in this respect, as in the structure of its horns, bears a nearer affinity to the *Deer* than to the *Antelopes*." Nor is this the only instance wherein an irregularity of conformation has been observed with respect to the presence of a gall-bladder: thus, in the class of birds, the French Academicians failed to detect it in four out of six specimens of the *Demoiselle Crane*, (*Grus virgo*); nevertheless, such instances of irregularity are extremely rare, and extensive groups are characterized (among other particulars) by the seemingly constant presence or absence of a receptacle for the secretion of the liver, which it would be out of place here to particularize; my object has been to call some further attention to the subject as regards the true Musks, the affinities whereof induce a suspicion that the case recorded by Mr. Campbell will prove to be exceptional or abnormal, as adjudged by Mr. Owen to have been the fact in the instance of his first Giraffe.—*CUR. AS. SOC.*



seen in the Mulnad." Lieut. Tickell informs us that it "is found throughout the jungly districts of Central India, but from its retired habits is not often seen. It never ventures into the open country, where its want of speed would ensure its easy capture, but keeps among rocks, in the crevices of which it passes the heat of the day, and into which it retires on the approach of an enemy. In these the female brings forth her young (generally two in number) at the close of the rains, or the commencement of the cold season. The male keeps with the female during the rutting season, (about June or July,) at other times they live solitary. An idea," continues this gentleman, "prevails among the people in Singboom, not altogether void of probability, that at the season of the fall of the leaf, the 'Yar' never ventures beyond a few yards from its cave, as in walking along it sticks its sharp-pointed hoofs through the fallen foliage, which accumulates in such bunches on its legs as to cripple its movements altogether, should it prolong its rambles." (*Calc. Jour. Nat. Hist.* No. iii. 420.) How much further to the northward it may range, I possess no data for determining; but think it not unlikely that it will prove to inhabit suitable localities at the foot of the Himalaya.\* A second specimen of this animal, very young, and but just dead, has been obligingly presented to the Society by Mrs. Linstedt.†

3rd. Dr. Wallich has favoured us with a fine specimen of a Jackal (*Canis aureus*), of which common species the Museum did not previously contain an example; and with a pair (male and female) of the Corsac, or small Indian Fox, (*Vulpes Corsac*), a species which before was represented only by a very shabby and mutilated stuffed skin, though we possess a good skeleton of this pretty little animal. The male now set up is a particularly fine and handsome one.

4th. Dr. Pearson has presented the Society with two handsome skins, but unfortunately mutilated of the fore-paws, and inordinately stretched lengthwise, of a species of Otter, which I will notice presently; and one of a Weasel, which I suspect to be an undescribed species, allied to *Mustela Sarmatica*. Size of the Ermine, or European Stoat, (*M. Erminea*), and also nearly allied to that species, but rather darker (I write from memory only of the Ermine) in its colouring, with the tail-tip dusky reddish-brown, and less developed than the black tail-tip of *M. Erminea*; middle of the face, from the upper lip to the occiput, passing between the ears, and gradually fading on the nape into the general hue of the upper parts, much darker brown than the rest, contrasting, though not abruptly, with the fulvous of the cheeks; chin white, and shoulders and sides of the neck densely mottled with ill-defined dull

\* "Deer of several kinds, one a beautiful animal of the size of a Hare," are noticed as occurring upon Myn Pât, in Digurjah, in the *Bengal Sporting Magazine* for 1840, 536.

Mr. Hodgson has since noted the occurrence of a species which he considers new, and styles *Tragulus mimenoides*, in his Classified Catalogue of the Mammals of Nepal, *Jour. As. Soc.* 1840, 914. The generic appellation *Tragulus*, it may be remarked, applied by the late Mr. Bennett to the Chevrotains, was pre-bestowed by Col. Hamilton Smith on a group of small African Antelopes.

† When this was being mounted, I had the living one, which had been turned loose into a small enclosure, caught, that its form might be better imitated in the stuffed specimen; and the strength and vigorous resistance offered by the little creature, when taken, after rather a tiresome chase, were quite surprising: it struggled most violently, using its sharp hoofs with some effect; and, had it been a male, would doubtless have inflicted bad wounds with its tusks. This little animal is of a very indolent disposition, at least by day, when I have never known it move voluntarily from the bush under which it squats; upon being disturbed, it plunges among the herbage exactly like a Hog Deer.—E. B.



white spots, which suggest the name of *lunulalis* for the species, should it prove to be new: length about a foot, or rather more; and tail minus the hair about five inches additional. From Darjeeling, as are also the Otters.

5th. Mr. Bouché has presented us with a stuffed skin of *Lutra nair*.

6th. Among the recent specimens procured is a fine large female Otter, which appears to be the *L. Tarayensis* of Mr. Hodgson (*Jour. As. Soc.* 1839, 319), differing from the description given by that gentleman only in the under-parts being of a less whitish, or "pure yellowish-white" hue, and the paws scarcely albescent, but of a lighter and more fulvous brown than the rest. It also accords so nearly with Jenyns's description of the European species (*Brit. Vert.* p. 13), that I am doubtful if it will not prove to be the very same, though (judging from memory of the latter) it appears to me to be rather a stronger and stouter animal. General structure as described by Mr. Hodgson, and total length 46 inches, of which the tail (which is 3 inches broad at base, becoming much more depressed and tapering to the extremity,) measured  $17\frac{1}{2}$  inches; girth immediately behind the shoulders  $15\frac{1}{2}$  inches; limbs very robust, the anterior measuring  $6\frac{1}{2}$  inches from elbow joint, and entire naked palm to the extremity of middle toe  $3\frac{1}{2}$  inches; tarsus, to end of middle toe  $\frac{1}{2}$  inch, and hairy for  $1\frac{1}{2}$  inch. This animal had five large abdominal teats, and not the slightest trace (internally or externally) of a third anterior on the left side; which circumstance is interesting, as shewing how little dependence can be placed on the number of teats as a specific character: the lactiferous vessels were fully distended, indicating that the poor creature was giving suck. The fur is short, and (so far as I can remember) absolutely similar in colour to that of the British Otter, having the throat and sides of the face, to a line even with the eye and posterior base of the ear, rather dull or cineraceous white, which colour occupies only the tips of the hairs, and less of them on the lower part of the front of the neck and on the chest, till beyond the latter the lower parts are but slightly hoary: feet as described; and tail dark underneath; the white of the face, throat, and upper part of the fore-neck only, is abruptly divided from the dark colour of the parts above. This animal was shot on the salt-water lake above Calcutta; and I have had both its skin and skeleton set up.\*

The Otters which Dr. Pearson has presented agree with none of those described by Mr. Hodgson, but seem to be allied to the *L. monticola* of that naturalist, from which they differ in being not of a deeper, but of a more rufous, brown than the last: in the pallid hue of the under-parts being throughout abruptly separated from the brown above; and in "the intermediate incisors of the lower jaw" being placed in an even line with the rest, at least if the third or central pair be intended by Mr. Hodgson, but, if the second pair (intermediate to the central and the outermost) be meant, then there is a slight difference between this and the preceding species, wherein the series of lower incisors forms quite a straight line. Fur longer than in the preceding, more as in *L. leptonyx*, but much darker than in that animal, of a shining dark colcothar-brown at base, slightly grizzled with a pale annulation near the extremity; under-parts dull fulvous-white, formed by hairs of this colour, but moderately close, protruding through the dense inner felt which has a brown surface; this fulvous-white, too, is continued underneath to the tail-tip. Size about that of *L. nair*;

\* The same species inhabits the Indus, and I very much incline to the opinion, that it is no other than *L. vulgaris*. Three living cubs have since been brought to me.—E. B.

but the skins have been stretched so completely out of all shape, that admeasurements of them would not be trustworthy. From Darjeeling, as before noticed.

I have also obtained a very fine recent example of *Paradoxurus typus*, which has been mounted: and two live kittens of the *Felis Chaus*, Guldenstadt, not of Geoffroy, or *F. Kutas*, Pearson, *Jour. As. Soc.* i. 75, and *F. erythrotis*, Hodgson, *ibid.* v. 283. This is the common Jungle Cat of Bengal, and has a wide geographic distribution. It was discovered in the Caspian marshes by M. Guldenstadt, and has since been met with in the north-west of Africa by Ruppell and others, where, however, it must not be confounded with the nearly allied *F. caligatus*, Tem., or "Booted Lynx," of the Appendix to Bruce's Travels, which is the *F. Chaus* of M. M. Geoffroy and P. Cuvier. In Persia it is common, as also on the Himalaya, but I am not aware of its occurrence in Peninsular India, where doubtless, however, it exists, nor did I expect to meet with it in Bengal. The young merely differ, as usual, in having the markings somewhat brighter and more clearly defined.

Lastly, I have had a specimen prepared of the common Hare of Bengal, *Lepus ruficaudatus*? Is Geoff. *Dict. Class.* ix. 381, *sen L. macrotis*, Hodgson, *Jour. As. Soc.* ix. 1183, being a name which, if I mistake not, is pre-occupied, beside that it is much more applicable to other species, such as that of Egypt, well represented on some of the antique paintings of that country; also *L. indicus*, Hodgson, and *L. orientalis*, Brown, *Bengal Sporting Magazine*, July, 1836. This very common species was wanting to the Museum, and (as is oftentimes the case with the commonest animals) is all but unknown in Europe, where the *L. nigricollis* is erroneously supposed to be the common Hare of the Gangetic provinces, a species which I cannot learn is found in this part of India. I saw living specimens of the Black-necked Hare at Madras, and now regret that I did not secure some, for this species is wanting to our Museum; but I expected to find it equally abundant here, as also certain other animals which I could have procured on the same occasion. The Gangetic Hare is brought plentifully to the Calcutta bazaars, always alive if possible, and both it and *L. nigricollis* are remarkable for the loud squealing they emit when handled: they also bite severely if not taken up with caution. The flesh of the Gangetic species is very insipid. This animal is cited doubtfully by Mr. Ogilby as the *L. ruficaudatus* of M. Is. Geoffroy St. Hilaire, imperfectly described from a mutilated skin, and Mr. Ogilby adds a minute description of a specimen which was taken home by Dr. Royle, who informed him that the species is very common in the Doon and in the neighbourhood of Delhi: this appears to be the amount of what was known to European naturalists concerning it prior to the arrival of Mr. Hodgson's elaborate description of the species in the Society's Journal for 1841, p. 1183, where some notice occurs of its habits and favorite haunts. A previous description, however, exists in the *Bengal Sporting Magazine*, for July, 1836, where the following habitat is assigned to the species "Cauhal, Punjab, and the continent of India; but as yet unknown to the eastward of the Barampooteer." The same writer adds, "the Hare in this country sometimes takes to earth when hard pushed, but this is no more than has been occasionally known in England.\*" In this country, too, a Hare has more oppor-

\* "The Hares of India are small, but very staunch, and have one more chance of escape than their brethren in Europe, namely, by running to ground." Capt. Mundy's *Sketches*, i. 369. They are occasionally hawked at with the *Falco lugger*, Jerdon, *ibid.* ii. 39.

tness of putting this stratagem into execution, from the numerous holes or earths of animals all over the country. Their manners are, in every respect, the same as those of the English Hare: they are savage and ill-natured in their way, and fight with each other to desperation; and upon being wounded, they often bite and tear themselves; in consequence, a slight scratch often proves mortal. In some parts of the country they are very numerous, which an English game-keeper would not believe, considering the number of enemies they have, in the shape of Pariah Dogs, Jackals, Cats, Mongooses, Weasels (*Viverricula*), Hawks, Snakes, and though last not least, the native shikarees, who catch vast numbers of them, and sell them to the natives for two pice each, and to gentlemen for four annas. They surround a bush with nets about 3 feet high; the bush is then beat with sticks, when the Hare bolts out into the net, which he attempts to force himself through, and is caught unhurt. It is said that the fleetest Hares are found in Hurriana, where there are extensive plains; and I have been told that Dogs which could kill Hares with ease at Allyghur, were at a loss at Hansi, at which place I have often in vain tried them with the Rampoor and Persian Greyhound. I do not recollect ever being able to turn one, much less to catch it. A very superior breed of Dogs has now come into play, and no sportsman is seen with the large *tearing down* animals of by-gone times, when a poor little diminutive Indian Fox or a glutted Jackal were thought fit to contest in speed with *long Dogs*. The splendid Grey-hounds I lately saw at Meerut assure us these times are gone."

The genus *Lepus*, I may remark, has been very largely added to of late years, wherever the specific distinctions have been duly attended to. In North America alone, not less than 14 species have been clearly distinguished and described by my friend, the Rev. Dr. Bachman (*Vide Jour. Acad. Nat. Soc. of Philadelphia*, vii, parts i. and ii). It is not long since the Irish Hare (*L. Hibernicus*) was first recognised by the Earl of Derby to be totally distinct from the common species (*L. timidus*) of Great Britain and Europe,\* so that three are now known to be indigenous to the British Islands, besides the Rabbit, which latter appears to have been introduced originally from Barbary into Spain, whence it has been naturalized over all temperate Europe. The labours of Ruppell and of Hemprich and Ehrenberg have made known a considerable number of species from Syria and the north-east of Africa; and it cannot be doubted that many remain to be discovered throughout Asia. In the Burmese territories, however, I have been informed by a gentleman long resident, and

\* The Irish Hare grows as large, or nearly so, as *L. timidus*, but is much more nearly allied to *L. variabilis*; from which it is readily distinguished by the considerably more rufous hue of its coat, which is also less dense, and has the inner felt rufous instead of white. The length of a small male, weighing 4lbs. 10 oz., which I procured, was 19 inches, the tail with hair three inches more; ears three inches and a half, and length of fore-limb from elbow joint seven inches, and of hinder from knee to claw eleven inches: tarse with claws five inches and a half: as in *L. variabilis*, there is no black on the tail, except a few scattered hairs. The fur has the same general aspect as in that species, which is very different from that of *L. timidus*, being soft, of a sandy-brown colour, with curly hoary tips intermixed; beneath pale. Outside the ears it is much longer than in *L. timidus*; the latter are black-tipped, and pale posteriorly. The flesh resembles that of the Common Hare much more than the Alpine. This Irish species affects marshy situations, and when hunted leaps with great agility over the stone walls that divide the country in some parts. A considerable number of the *L. timidus* have lately been turned out in different parts of Ireland.

I may take this opportunity to notice another European species, which I suspect is new. I saw several barrels of the skins at one of the enormous collections of peltry exhibited at the half-yearly sales of the Hudson's Bay Company, where specimens

devoted to zoological studies, that none have hitherto been observed,\* nor am I aware that any have been met with in the great islands of the Oriental Archipelago; but in China there are doubtless several, and one from that country has been figured by Messrs. Hardwicke and Gray as *L. Sincensis*, besides which the *L. variabilis* (or much more probably an allied species, gregarious in its migrations like various other rodents,) is known to inhabit Chinese Tartary. In Little Tibet, my friend Mr. Vigne observed a rather large species, a skull of which he took to England, and which, it may be, is the *L. Oistolus* vel *Æmodius* of Mr. Hodgson (*Jour. As. Soc.* ix. 1186),† and this or another species is "common everywhere in Afghanistan" (Elphinstone's *Cabul*, 141). Lieut. Irwin also notices that "Hares are generally diffused" in that country, and that "white Hares are chiefly found beyond the Jaxartes. In Cabul only is the Hare kept in a domesticated state, and they may be purchased in the market for half a rupee each. The Rabbit is not found in these countries, India, or Persia" (*Jour. As. Soc.* viii. 1007), i. e. not in a wild state, for there is no lack of domestic Rabbits in Calcutta.‡ In the Indian Peninsula, I knew only of *L. ruficaudatus* (?), which Mr. Hodgson assigns to "the Gangetic plains and Sub-Himalayas," and *L. nigricollis*, which the same gentleman formerly included in his Catalogue of Nepalese Mammalia (*P. Z. S.* 1834, 86), as an inhabitant of the Tarai, though the omission of this species in his subsequent lists would seem to intimate that at that time he had mistaken the species. Col. Sykes states *L. nigricollis* to be "very common in the strong and bushy hills of Dukhan;" and I have some reason to suspect the existence of another upon the Neilghierries. A curious

from all parts of the world are brought together. On the same occasion I observed a pile of several dozen skins of the *Kobus ellipsiprymnus* (A. Smith) of South Africa. Of *Lepus*, were some large packages of skins of the Polar Hare, and the present species was known to the dealers by the name of *Polish* or *Russian Rabbit*, Length about a foot and a half; the ears two inches and a half, and tail with hair nearly two inches, moderately bushy, and pale brown above, having no black on it. Fur in winter about an inch and a half long, the basal third dusky or slate colour, then rather pale fulvous for  $\frac{1}{2}$  inch, the remainder white; of one quality, delicate and lying straight, exceedingly soft, and winter surface appearing pure white; the ears black at base of hairs, but overlaid with white, the edges alone appearing black. A specimen, apparently killed in autumn, with white hairs growing among the rest, had the summer coat fulvous with black tips, the fulvous changing to white before being shed, and the front part of the outside of the ears brown; skin remarkably thin and delicate. It is possible that this may be the *L. Agrioides* of Pallas, which I do not know; but, if undescribed, it might bear the appellation of *L. Sclavonicus*.

A species of Hare from Sardinia has lately been described by M. Wagner, by the name *L. Mediterraneus*. The islands of Sardinia and Corsica are highly remarkable in their Zoology, containing besides a peculiar Weasel (*Mustela boccamela*), a distinct Stag from that of Italy and the continent of Europe (*Cervus Mediterraneus*), the wild Moufflon Sheep, &c.; nor is the botany of the same islands less remarkable. E. B.

\* Since writing this, I have been informed that a species of Hare, nearly resembling if not identical with that of Bengal, is common on the Siamese hills, on the eastern border of the Company's territory; and reverting to Crawford's "Embassy to Ava" (p. 456), I find it there stated that "the Hare is not known in Pegu, but makes its appearance on the high lands before the disemboguing of the Irawadi. It is a small animal, similar, in all respects, to the Indian Hare."—E. B.

† Described, I now find, in *Proc. Zool. Soc.* for Jan. 26, 1841, as *L. Tibetanus*, Waterhouse, and presumed to be identical with *L. oistolus*, Hodgson; vide *An. and Mag. Nat. Hist.*, Nov. 1841, p. 234.

‡ Vide the last No. of this Journal, x 979, for another notice of the Hares of Afghanistan.

species has been described by Dr. Pearson from the northern hills, which would scarcely seem to be either a true *Lepus*, or a *Lagomys*. "Its hair is harsh and bristly; ears very short, not projecting beyond the face; length 18 inches, and colour more dusky grey than that of the [Gangetic] Hare. Inhabits Assam, especially the northern parts of the valley along the base of the Eastern mountains" (McClelland, in *Proc. Zool. Soc.* 1839, 152). Dr. McClelland adds, "I am indebted to Lieut. Vetch of Assam for the skin of this animal, but unfortunately the skull is wanting; but according to Mr. Pearson it is the same as the skull of the common Hare." Were it not for the last statement, I should have conjectured the animal to have been a true Marmot. Dr. Pearson names it *L. hispidus*.

#### Fossil Mammalia.

In this interesting department, I have the pleasure to record the acquisition of another fine head, at least the greater portion of one, of *Mastodon Elephantoides*, which was purchased for the Society by Mr. Piddington. It was imbedded in a very hard gray limestone, apparently the same as, or differing very little from, the matrix of some of the Sivalik fossils, whence it is probable that it was derived from the same Sub-Himalayan formation.

I have also been so fortunate as to discover, among the numerous valuable reliques from the Sivalik ranges, which were presented to the Society by Col. Colvin (vide *Jour. As. Soc.* v. 183), part of the head and bony cores of the horns of a large species of *Ovis*, nearly allied to, if not absolutely identical with, the *O. Ammon* of Siberia (vel? *Hodgsonii*, *Nobis*, seu *Ammonoides*, *Hodgson*, of the Himalaya); and a corresponding portion of a true *Ibes*, to all appearance identical with the species (*Capra Sakeen*, *Nobis*,) which still inhabits the loftiest Himalayan crags. It is unnecessary to dwell here upon the conclusive proof afforded by the occurrence of these highly interesting remains of the existence of lofty, and even snow-clad, mountain heights in the immediate vicinity of the region then tenanted by the *Sivatherium* and its extinct contemporaries; but I shall avail myself of the earliest opportunity to draw up a memoir on the subject, illustrated by figures of the splendid fossils which there cannot be the slightest hesitation in identifying (generically) as aforesaid.

In the same collection of remains, is the frontlet with portions of the cores of the horns of a remarkable large species of ruminant, which being neither referrible to the Oxen, Sheep, nor Goats, has (as is customary in such cases) been assigned to the general receptacle for such non-conformists—the vast pseudo-genus *Antelope*; but it is as distinct from any of the living forms hitherto discovered and ranged in that empirical assemblage, as many of the latter are from each other. At present, I hesitate as to which of them it even most approximates.

#### Aves.

In the class of Birds, our acquisitions, since the last Meeting, have been so very considerable, that I can only notice a few of the more interesting, either as being apparently new, or rare, or for the purpose of elucidating their synonymy. From R. W. G. Frith, Esq. the Society has received a donation of 165 specimens of skins,

referrible to more than 100 species, 20 of which are new to the Museum, and many more equally acceptable. The greater number of them were procured in Upper Bengal, or in the hills, but there are some from Malacca, and among these, it is worthy of notice, 4 species of South American birds were received, which are as follow :—

*Galbula ruficauda*, Cuv : male and female.

*Pipra rubricapilla*, Tem.

*Tanagra azurea* ? being the species figured in Griffith's Animal Kingdom, vii. 490, as the "Azure Tanager": two specimens, and a . . .

*Xanthornus*, apparently the *Oriolus Americanus*, Gmelin.

These are strictly forms characteristic of the western continent : though it may be mentioned here, that in the "Proceedings of the Zoological Society" for 1836, p. 113, Mr. Burton exhibited a small Himalayan bird referred by him to *Pipra*, as "the first species of this genus hitherto discovered in those regions;" it might be equally averred, on the whole eastern continent, though the oriental genus *Calypturnesia*, Horsfield, is unquestionably allied to *Pipra* and *Rupicola*, as also, probably, the *Cratisonyx* of Eyton (*P. Z. S.* 1839, 104). With respect to the Jacamars (*Galbula*), it is remarkable that Levaillant positively asserts having received his *Jacamerops* (the *G. grandis*, Latham,) from the Eastern Archipelago, and Cuvier followed him in considering this as the type of a supposed oriental section of the genus (*Regne Animal*, i. 448); but it has since been ascertained to be South American, like all of its congeners hitherto discovered.

Among those eastern species which may be noticed, I shall distinguish such as are new to the collection by an asterisk.

\* *Palæornis Malaccensis*, Vigors (*Zool. Jour.* ii. 520), and figured in the volume on Parrots in Jardine's "Naturalist's Library."

\* *Falco lugger*, Jerdon (*Madras Jour.* No. xxiv. 80); apparently an adult female of this fine species, which is nearly allied to the Lanner (*F. lanarius*.)

*Hyptyopus* (Hodgson, *Jour. As. Soc.* 1841, 27, olim *Baza*, H. *Jour. As. Soc.* 1836, 777,) *lophotes*; *Falco lophotes*, Tem; *B. syama*, Hodgson; *Buteo cristatus*, Vieillot; *Lepidogenys Lathamii*, J. E. Gray: two fine specimens.

*Circus melanoleucos*.

*Alcedo* (subgenus *Ceryle*, Boie, 1828, *Ispida*, Sw.,) *guttatus*; two fine specimens.

*Dacelo pulchella*, Horsfield, male and female; at least I judge what I have termed the latter to be of this species, though differing much in plumage from the male (which is figured in Dr. Horsfield's *Zoological Researches in Java*); there is no blue upon its plumage, the upper parts of which are everywhere barred with rufous on a black ground, these markings being widest upon the wings and tail, and closest and narrowest about the neck; cheeks and ear-coverts like the crown, and under-parts ruddy white, barred with dusky across the breast and on the flanks. Mr. Eyton (in *P. Z. S.* 1839, 101,) classes this species in *Halcyon*, but I see no reason to follow his example.

*Merops Sumatranus*.

*Napophila* (Hodgson, *Jour. As. Soc.* 1841, 29, olim *Bucia*, H., *Jour. As. Soc.* 836, 360,) *amicta*; *Merops amictus*, Tem.

*N. Athertonii*, *Merops A.*, Jardine and Selby (*Ill. Orn.*, pl. lviii); *Nycticorax cæruleus*, Swainson; *Napophila* (olim *Bucia*) *Nipalensis*, Hodgson; *Merops cyano-*

*galvris*, Jerdon;\* genus *Alcederops*, Is. Geoff. (1832), apud G. Gray; of these various names, I could wish to adopt the more recent generic appellation bestowed by Mr. Hodgson, but his specific term, independently of its lack of priority, is objectionable, inasmuch as that the bird is found both on the Neilgherries and in the Malay peninsula, whence it extends northward through Tenasserim to Assam and Nepâl. *Nyctioris*, Sw. is inapplicable, for, according to Mr. Hodgson, "the bird is in no way or degree a night bird" (*Jour. As. Soc.*, 1841, 29),† while *Nepophila* is expressive of its haunts, and *Alcederops* (implying an intermediateness to *Merops* and *Alcedo*, which I am quite unable to discern,) is certainly not a felicitous compound. Both in habits and internal structure, to judge from Mr. Hodgson's description (*Jour. As. Soc.* 1836, 352), these birds are intermediate rather to the Bee-eaters on the one hand, and on the other the Jacamars and true Todies of South America; they have much the same puffy plumage, also, as the latter; and whereas the true Bee-eaters (*Merops*), Rollers (*Coraciæ* and *Eurystomus*), and Kingfishers (*Halcyon*, *Alcedo*, &c.), which, with the exception of a few large species of the last, are peculiar to the eastern hemisphere, have the intestinal canal devoid of caecal appendages, Mr. Hodgson describes the present bird to have cæca of an inch or more in length, in which particular it accords with the Jacamars (*Galbula*), Todies (*Todus*) and Motmots (*Prionites*), of South America. Mr. Hodgson adds, that the stomach and intestines of *Merops* are similar to those of *Nepophila*, but this is at variance with my own observations of the former, wherein I could never detect any trace of cæca.

*Picus Sultanus*, Hodgson (*Jour. As. Soc.*, vi, 114); agreeing, at least (as does also another specimen in our collection), in every particular except size with Mr. Hodgson's description. This naturalist, indeed, remarks that "there is another Nepâlese species scarcely distinguishable from this by colours, and which has been confounded with it by those who venture to describe from one or two dried specimens. The two species differ, however, *auto cælo* in all typical and characteristic respects." Hence it is clear that our present bird cannot be here referred to, and little less so that the Indian three-toed Woodpecker (*P. tiga*, Horsfield,) is intended, for this species scarcely differs in colouring, except in having the back of the neck black instead of white, and in the relative breadth of certain markings on the sides of the neck. The dimensions which Mr. Hodgson assigns to both sexes of *P. Sultanus*, are 15 inches long by 23 inches across; bill  $2\frac{1}{4}$  inches long; 1st quill feather 8 inches shorter, and 2d 1 inch shorter, than the 5th. In the larger specimen now before me, the entire length could scarcely have exceeded 13 inches (may not 15 have been a misprint?); bill from forehead barely 2 inches, and in the other not  $1\frac{1}{2}$  inch; from gape  $2\frac{1}{4}$  inches and  $2\frac{1}{2}$  inches; wing from bend 7 inches and  $6\frac{1}{2}$  inches; the first primary respectively  $2\frac{1}{4}$  and 3 inches shorter, and the second nearly  $\frac{1}{2}$  in. and  $\frac{1}{2}$  in. shorter, than the fifth. Both are males, and in all other respects precisely accord with Mr. Hodgson's description.

*Cuculus* (subgenus *Chalcites*, Swainson, *Lampromorpha*, Vigors,) *lucidus*, Gmelin: a splendid male. The female of this species is described as *C. Malayanus*, Raffles

\* Also, I much suspect, *Nyctioris Amherstiana* of the catalogue of birds in Dr. Royle's *Illustrations of the Botany, &c. of the Himalayas*.—E. B.

† Mr. Jerdon has since remarked the same, in the *Supplement* to his valuable catalogue of the birds of Peninsular India.



(*Lin. Trans.* xiii, 286), and the *C. metallicus*, Vigors (*Ibid.* xv, 302), is no other than the young, as satisfactorily shown by specimens in transitional state of plumage.

\* *Podargus* — ?

\* *Lanius nigriceps*; *Colaptes nigriceps*, Franklin (*P. Z. S.*, 1831, 117).

*Picus tristis*: female.

\* *Yuzar torquilla*; taken near Calcutta.

\* *Pteruthius erythropterus*, Swainson; *Lenius erythropterus*, Vigors and Gould: a young male, agreeing with Gould's plate of the female, except in having a conspicuous whitish eye-streak, like that of the adult male, while the crown and back are uniformly greyish brown, the feathers of flimsy texture, and slightly tinged with greenish on the scapularies; under-parts white, having some growing new feathers tinged with fulvous on the sides of the breast. An adult female before me differs from Gould's figure of this sex in having the upper-parts darker and more inclining to cinereous-brown, quite a different hue from that on the plate, and the crown much darker and dusky grey; bill more hooked than in the young bird.

\* *Muscipeta paradisea*; two males, which sex is new to the Museum.

*Phenicura atrata*, J. and S. (*Ill. Orn.* pl. lxxxvi): male and female; the former new to our collection, and differing from the figure referred to, and the Latin definition of the species, in wanting the bright rufous margining of the wing feathers, which are edged with greyish, having but a slight rufous tinge on the border of the tertiarium only. Of the various Indian true Redstarts, this is the only species I know of which occurs in the southern parts of the Peninsula,\* and the present are the only specimens I have seen of it from the northern hills. It is common in the vicinity of Calcutta.

\* Mr. Hodgson, in the "India Review," (for 1832, p. 65,) has described a small group of birds allied to the Redstarts, but quite properly distinguished from them, which he there styles *Niltava*, having since substituted the appellation *Chastaris* (*Jour. As. Soc.* 1841, 29); three species are distinguished by him, of which two appear to have been previously named; viz. *Ch. brevipes*, H., which is the *Phenicura rubeculoides*, Vigors, (*P. Z. S.* 1831, 35), as identified by Mr. Hodgson; *Ch. fulgiventis*, H. which, from comparison of the descriptions, would seem not to differ from *Phenicura McGregarii*, Burton (*P. Z. S.* 1835, 152); and *Ch. sandara*, Hodgson, of which beautiful species a fine specimen occurs in the present collection, with two of *Ch. rubeculoides*, all males. In another collection of birds now confided to my charge from Darjeeling are two males and a female of *Ch. sandara*, and two males and two females of an additional true species, considerably larger than the others, which I intend to describe as *Ch. grandis*. The group is an extremely natural one.

*Turdus* (*Oreocincla*, Gould,) *Whitii*, Eyton.

\* *Crateropus ocellatus*; *Cinclosoma ocellatum*, Vigors.

\* *Oriolus Traillii*, Hodgson; *Pastor Traillii*, Vigors and Gould: a female.

\* *Chloropsis*, J. and S., seu *Phyllornis* of Temminck: two species. One is the *Ch. Somnerati*, J. and S., or *Ph. Mullerii*, Tem.; two males, and new to the collection: the other the *Ch. Hardwickii*, J. and S. (described in the *Addenda* to the 2nd volume of the "Illustrations of Ornithology," from a coloured figure in the collection of the late Major General Hardwicke), seu *Ch. cyanopterus*, Hodgson, and *Ch. cyano-*

\* Mr. Jerdon has lately described two others in his *Supplement*.



gaster, McClelland and Horsfield (*P. Z. S.* 1839, 167). There are two specimens also of this bird, which form an interesting series with two others previously in the Museum, illustrative of the changes of plumage undergone by the species. Other specimens from Darjeeling are also before me, and I avail myself of the occasion to note the following particulars: the young male has all the upper-parts, with the breast, uniform Parrot-green, tinged with yellow on the throat; the hyacinthine streak from each side of the base of the lower mandible being reduced to slight tips to the feathers, by no means conspicuous; the lower tail-coverts are green, and this appears to have been also the case with the whole under plumage; shoulder-spot as usual: the fully (?) mature female differs in having the upper-parts a slight shade more yellowish green, but there is no yellow on the throat, which is tinged with verditer, and has a well-defined hyacinthine streak on each side, not quite so deeply coloured as in the male; below the breast, the under-parts are mingled green and buff-orange, the lower tail-coverts being of the latter hue, and the primary wing and tail feathers are green, the latter a little tinged with bluish on their inner webs, and the former being slightly edged with dull verditer, towards the tips only, excepting on the three outermost: at the first moult, when the wing and tail primaries (as in various other birds) are not changed, the young males assume the dusky-purple, or purplish-black, colour of the throat, fore-neck, and breast, the black lores and ear-coverts, bright hyacinthine moustache, and golden-buff colour of the belly and under tail-coverts, and one of three specimens before me (in different stages of this moult,) having lost one of its caudal feathers, no doubt by accident, has had it replaced by one a little longer than the rest, and of a purple colour slightly mixed with green; more or less dusky-purple also appears, at this age, on the smaller wing-coverts, and especially below the generic verditer tuft upon the shoulders of the wings; the crown inclines to yellowish, and in fact the mature plumage is everywhere attained, excepting on the wings and tail; the primaries and their coverts, with the winglet, and the caudal feathers, but not the coverts of these, appearing, at the second moult, of a rich dark purple, which is characteristic of the fully mature masculine livery, and hence Mr. Hodgson's appellation of *cyanopterus*.

*Cinnyris nuptialis*: *Nectarinia nuptialis*, Temminck; *Goelpara Creeper* of Latham, and *Certhia Goelpariensis* of Royle's "Illustrations"; *Cinnyris Vigorsii*, Sykes, *C. miles*, Hodgson, and *Nectarinia Seheria*, Tickell. A fine specimen of this gorgeous little bird, the range of which extends from the Himalaya to the Deccan, and through Tenasserim and the Malay Peninsula to Java.

\* *C. Horsfieldi*, Nohis; a beautiful little species, allied to the last, together with *C. Nipalensis*, Gould, *saturata* vel *Assamensis*, and several others, which I mean shortly to describe—as also,

\* *Antheptes macularia*, Nohis: a species allied in plumage to the *Arachnothera*.

*Eurplains nactus*, Tem. Mr. Swainson designates this species the "Black-billed Gaper;" but I am assured that the beak is of a beautiful blue colour in the living bird.

*Eur. ochromalus*, Raffles, *Linn. Trans.* xiii, 297; the preceding species being there described as *Eur. lemniscatus*, Raffles.

\* *Coccothraustes melanoxanthos*, Hodgson (*As. Res.* xix. 150). A magnificent species of true Hawfinch, unfortunately not in very good condition, and in nestling

plumage. Length 9 inches, wing from head 5 inches, and tail, which is slightly forked, 3 inches to end of exterior feathers; bill, in this young bird, nearly 1 inch long from forehead, and more than  $\frac{1}{2}$  inch deep: plumage very like that of a nestling Goldfinch (*Carduelis elegans*), tinged with yellow on the abdomen, and especially on the under tail-coverts which are spotless yellow; also on the inner webs of the central dorsal feathers, forming the same mesial streak along the back as in a Siskin or Redpole Linnet, a young Crossbill, &c.; the rest of the back, scapularies, rump and upper tail-coverts, dusky, each feather margined with brown, which passes into greenish towards the tail; tertiaries shaped as in a European Goldfinch, and broadly edged with yellowish-white towards the extremity of their outer webs; primaries and secondaries slightly edged, and their greater and smaller coverts tipped with the same, the latter forming two narrow bars across the wing; crown and neck pale buff at the bases of the feathers, which have each a large dusky spot at its tip, causing the crown to appear of this colour; a pale streak over the eye, and a narrow one tinged with yellow from the gape, above which latter a broad dusky streak passes through the eye, and below it is a large triangular spot of the same; under-parts pale fulvous, or deep fulvous-white, becoming gradually more yellowish to the tail-coverts, each feather, excepting on the throat and middle of the belly, having an oval dusky spot; a line of such spots proceeds also from each corner of the lower mandible down the sides of the front of the neck: a few new feathers which were growing on the breast are brighter-coloured, with the spot very much reduced in size; hence the specimen would appear to have been a female, according to the description furnished by Mr. Hodgson. That naturalist described another species from the Himalaya, as *C. cornipes*; a third from the same mountain regions exists in the *C. icteroides*, Vigors (*P. Z. S.* 1831, 8, and figured in Gould's *Century*); and a fourth, from the neighbourhood of Canton, is figured by Messrs. Jardine and Selby (*"Illustrations of Ornithology,"* pl. lxiii), as *C. melanura*; besides which, the European *C. vulgaris* is included in M. Temminck's *Catalogue of the birds of Japan*.

*Pyrgita cinnamomea*, Gould (*Proc. Zool. Soc.* 1835, 185), male and female—We before possessed specimens of this handsome Sparrow from Bootan, but the present are considerably more brightly coloured, and their plumage less worn: the sides of the neck of the male are pale clear yellow, divided by the broad black gular streak; and the middle of the abdomen also is much tinged with the same; whole upper plumage and fore-part of the wings, anterior to the white tips of their smaller coverts, bright cinnamon-rufous, marked as in other Sparrows on the middle of the back: the female has also a slight tinge of this rufous, especially on the sides of the neck, the rump, and the fore-part of the wings, and there is a faint tendency to yellowish beneath; one of two specimens of this sex has the dark gular streak of the male moderately distinct. I am acquainted with five species of true *Pyrgita* inhabiting India (one of them new), but have seen none corresponding to the *Passer Indicus* of Messrs. Jardine and Selby (*Ill. Orn.* pl. cxvii).

*Argus giganteus*, Tem. An exceedingly fine specimen of the female, which is much rarer in collections than the male, and bears a far higher price among the dealers.

\* *Cryptonyx coronatus*, Tem. ; male and female.

\* *Otis*. Two specimens of Bustards, alleged to be the *Floribon* and the *Leak* of Indian sportsmen: much confusion prevails respecting the application of these two

names, arising from the circumstance that all the species of this genus change their plumage twice in the year, and that in many of them the breeding dress of the males is so different from that which succeeds it, that observers are apt to regard as different species what are merely two seasonal phases of the same bird; nor is this the only source of confusion in the present instance; there really are two Indian species, which by some are more appropriately distinguished by the names mentioned; while others regard the males of both in nuptial livery as the *Floriten*, or *Black Floriten*, and refer them to the *Leek*, or *Common Floriten*, when in the plumage which alternates with the breeding dress; a third class, having observed the mutation in one or the other of these species, and thus positively ascertained that the alleged *Floriten* and *Leek*, as known to them, are one and the same, naturally enough conclude that but one species is referred to by these appellations, as indeed appears to be truly the case in Southern India, where the *Leek* of Bengal, or *Otis aurita*, is the only species included in Mr. Jerdon's valuable catalogue, in addition to the large *O. nigriceps* (figured in Gould's *Century*), which is there exclusively styled *Bastard*. The specimens now under consideration consist of a beautiful male of *O. deliciosus*, Hardwicke, (or *Himalayana*, Vigors,) in full nuptial costume (as figured in Gould's *Century*), being the *Black Floriten*, and in its other dress the *Common* or *Bastard Floriten*—as sometimes distinguished from the *Leek*—of Bengal; and a female in summer dress of *O. aurita* (figured in Jardine and Selby's '*Illustrations of Ornithology*,' plates xl. and xcii), which, as before mentioned, is the genuine *Leek* of Bengal, at least of those who properly distinguish the two species; this latter is a much smaller bird than the other, and may always be at once recognized by the remarkable attenuation and sharp points of its wing primaries; it is a species new to our collection.

Among the Birds which have been procured in the neighbourhood, I may first proceed to notice two fine species of Erne, or Fishing Eagle, (*Haliaeetus*, Savigny.) One is the Ring-tailed Erne (*H. Macei*, or *Falco Macei*, Tem.), and from which I cannot perceive in what the *H. albipes* of Mr. Hodgson (described in *J. A. S.* v. 228, and further noticed in vi. 367-8,) differs, bearing in mind that *H. Macei* was originally described from a dry skin; moreover the *H. unicolor* of Mr. Gray, founded on one of the drawings published by him from the late Major Gen. Hardwicke's extensive collection, I very strongly suspect will prove to be merely the second plumage of the same bird. Our Museum contains two specimens of this alleged *H. unicolor*, one of them being known with certainty to be of the age mentioned; otherwise, it might have been suspected, from the lengthened and attenuated form of its nuchal plumes, to have been older; it is probable that the third plumage of the species will prove to be intermediate, and I trust to be soon able to procure one in transitional state of feather, which would settle the question beyond dispute. This fine large species, the worthy oriental representative of *H. albicollis* in Europe, *H. leucocephalus* in North America, and three or four more in different regions, appears to be not uncommon in Bengal, and is included in Dr. McClelland's Catalogue of the birds of Assam (*P. Z. S.*, 1839, 153), appearing, indeed, to be plentiful throughout the course of the Ganges and Boorampooter with their tributaries; but it is not mentioned in any of the lists which I have seen of the birds of Peninsular India, not even in the very elaborate catalogue furnished by Mr. Jerdon, and published in successive numbers of the *Madras Journal of Literature and Science*. Mr. Hodgson mentions that his *H. albipes* frequently robs the Osprey of its spoil, just as the White-headed species of the west does the Osprey of that re-

gion; the latter, indeed, being specifically the same on both continents. The magnificent specimen of *H. Macci* now exhibited, as also another which I have procured and set aside as a skin, both of them females, measured 2 feet 8 inches long by 6½ feet in extent of wing. The form is typical, as exemplified by *H. albicollis* and *H. leucocapillus*.

The other species I have not been able to determine: it belongs to the group of Osprey-like *Ernes* (*Ichthyæstus*, Lafresnoy), peculiar to the countries bordering on the Indian Ocean, and exemplified by *I. Horsfieldi* (*Falco ichthyæstus*, Horsf.), *I. blagrus* (*H. plumbeus*? Hodgson), the Australian *I. leucogaster*, Gould, and I believe some others.\* Our Museum previously contained examples of *I. Horsfieldi* and *I. blagrus*. The present species is figured in one of the drawings of the late indefatigably laborious Dr. Buchanan Hamilton, and a female procured in the vicinity of Calcutta measured 2½ feet long by 6 feet 1½ inch in extent of wing; the latter from bend 21½ inches, and tail 14 inches: bill, including cere, 2½ inches over curve of upper mandible, and 2½ inches from its point to the gape; tarse posteriorly 3½ inches; talons moderately large, with trenchant inner edges (wherein this species differs from *I. Horsfieldi*, and less decidedly from *I. blagrus*), and foot very rough underneath. Bill whitish-horny, having a tinge of bluish for the basal half, and becoming dusky towards the tip; cere scarcely differing in hue, but slightly waxy. Irides white, or rather becoming white, being a little suffused with brown in the specimen. Legs and toes ivory-white, as in *H. Macci*; but differing from that species in scutellation, having a series of nine large scales along the whole outer front surface of the tarse, and those on the toes, especially on the hind one, being remarkably prominent and projecting towards the talons. General aspect, at first glance, not unlike that of an Osprey (*Pandion*); the head, neck, under-parts, thighs, and tail, white, tinged more or less with rusty-brown, and the new feathers, which are everywhere appearing among the rest, more deeply so, whence these parts, excepting perhaps the tail, would have become clear pale rufous, confusedly mottled with dusky on the sides of the breast and upon the crown: the tail is much cuneated, and has some irregular scattered dark spots on its basal half, while the extremity is confusedly freckled with dusky, darkest on the outermost feathers, the extreme tips being whitish: wings and mantle aquiline-brown; the primaries dusky, the interscapularies slightly tipped with white, and the small wing-feathers which are impended (more or less) by the scapularies, conspicuously bordered with the same; an ill-defined bar of paler brown across the wings. The intestines of this bird were elongated, as in the Osprey: in its stomach were found three small water-snakes, some articulus of Crustaceans, the humerus of a bird the size of a Mynah, and the remains of a small rodent. Dr. Cantor recognises the species as one which he has examined and found aquatic snakes in its stomach. Should it be undescribed, I proposed to designate it *I. cultrunguis*.

\* *Athene Indica*; *Noctua Indica*, Franklin, *P. Z. S.* 1831, 115; *Strix Brama*, Temminck. A specimen also occurs in Mr. Frith's collection. It is probable this little Owl will soon be found to be admissible into the European Fauna, for it is ascertained to be "common about the foot of the mountains near the town of Erzeroum" (*P. Z. S.* 1839, 119).†

\* The Society has since received a small species from the Malay Peninsula, nearly allied to *I. Horsfieldi*, and which I shall describe as *I. nanus*.—*Con. As. Soc.*

† Vide especially a notice in *Mag. Nat. Hist.* for October 1841, p. 125.

*Alcedo* (subgenus *Ceryle*, Boie, 1828,) *rudis*, Lin.; *Ispida bicincta*, Swainson, *Nat. Lib., Orn.*, viii. 95. "When we find all authors," writes Mr. Swainson, "affirming that the black and white Kingfisher 'inhabits various regions, both of Asia and Africa, Egypt, Persia, Senegal and the Cape of Good Hope,—that it varies both in size and in the particular mixture of its colours,' it is impossible not to conclude that more than one species is confounded under the common name of *Alcedo rudis*, and that in all probability this mixture of black and white in the plumage, instead of being the character of a species, more probably belongs to a small division of the genus. The bird now before us," he continues, "affords at least a confirmation, in one instance, of such a supposition. All writers (see particularly Edwards, i. pl. ix., Buffon, Edit. Benozini, xx, 192, and *Pl. Col.* 716,) agree in stating, that the true *Alcedo rudis* of the Cape of Good Hope has but one black belt on the breast, whereas the species now before me has two; when, therefore, we find so strong a specific distinction between birds inhabiting two localities so comparatively near to each other as Senegal and the Cape, we may fairly conclude that the other black and white Kingfishers, of regions vastly more distant, will eventually prove to be equally distinct." The truth happens to be, that the double-banded is merely the male, and the single-banded the female, of this widely diffused species, which is included among the birds of Europe by Mr. Gould, as an inhabitant of its south-eastern border. It is of frequent occurrence in Bengal, and follows the whole course of the Ganges to the foot of the Himalaya. Dr. McClelland met with it in Assam, and it is included in the catalogue of birds procured by Dr. Boyle at Saharunpore and in the Himalayas, as an inhabitant of the plain country. It is also plentiful about Rangoon. Mr. Jerdon states it to be "common all over India, frequenting brooks, rivers, and tanks: unlike the other Kingfishers," he adds, "which watch their prey from a fixed station and then dart down obliquely on it, the Spotted Kingfisher searches for its prey on the wing, hovering over a piece of water like some of the Terns, and then darting down perpendicularly on it." (*Mad. Jour.* xi. 227). So, indeed, does the common British Kingfisher (*A. ispida*), very commonly, and doubtless, also, its Indian near ally (*A. Bengalensis*), at least occasionally, though I have never observed this of it. Mr. Strickland, again, who remarked the *A. rudis* in Syria, informs us, that "it may be often seen in the salt-water marshes west of Smyrna:" there, however, "it never seems to follow the rivers, but always remains near the coast. It sometimes hovers for several minutes about ten feet above the water, and then drops perpendicularly on its prey" (*P. Z. S.* 1836, 100). Such are precisely its habits in Bengal; and it may not unfrequently be seen resting on the bank, and jerking its tail at intervals. Together with the large Himalayan *A. guttatus*, this species appertains to a well marked subdivision of true Kingfishers (the *Ceryle*, Boie, or *Ispida*, Sw.), generally characterized by large size, chiefly black and white plumage, and considerably longer wings and tail than in the subgroup exemplified by *A. ispida*, *Bengalensis*, *semitorquatus* (Sw.), &c.; hence they might be expected to seek their prey more on the wing, conformably with the foregoing observations. It is remarkable that this subgenus is the only one not only of the family *Halcyonidae*, but of a larger natural group comprising the latter, which is represented by species in the New World. The males of *A. rudis* vary in the developement or breadth of the second pectoral band, and in the quantity of spotting in front of the neck, above the first band, which latter is sometimes interrupted in the middle, as it generally is in the females; these

have no trace whatever of the second band, and seldom any spotting in front of the neck, but a patch on the flanks (a little anterior to the thighs) is equally developed in both sexes.\*

*Cuculus fagax*, Horsfield, ~~on~~ *Bychan* Cuckoo of Latham; *C. Lathamii*, Gray and Hardwicke, or *Bhrow* Cuckoo of the latter, being evidently a mode of spelling the Bengalee form of the Hindee word for "great," which is applied by the natives to this species in contradistinction to certain others, as more especially the *C. tenuirostris*, Gray and Hardwicke, which latter, I may remark, is not identical with *C. Sonnerati*, vel *Himalayanus*, Vigors, as supposed by Mr. Jerdon, but is the same as his doubtfully cited *C. flavus*, this again being quite different from the *C. flavus*, Auctorum. Upon another occasion, I will endeavour to elucidate the various Indian and Malayan species of the family *Cuculidae*.

*Collioche Lathamii*, Gould (*Icones Avium*) ; *Motacilla Collioche*, Pallas ; *Turdus Collioche*, Latham ; *Accentor ! Collioche*, Temminck. A beautiful male, added to the female which was exhibited at the last meeting. This bird extends eastward to Kamtschatka and Japan. It is not included in any of the published catalogues of the species of Southern India ; but Lieut. Tickell notices it in his 'List of birds collected in the Jungles of Berabhum and Dholbhum' (*J. A. S.* ii. 575), as "rare, solitary, and silent. Haunts thickets and underwood. Was found at Dampera in Dholbhum, and at Jehanabad, west of Hoogly." As we had a specimen previously in the Museum, in addition to those now obtained, it is probably not very rare in the vicinity of Calcutta during the hyemal months.

*Salicaria* (Selby, subdivision *Acrocephalus*, Naumann, v. *Calamokerpe*, Boie,) *turdoides* (?) ; *Turdus arundinaceus* (?), Lin. ; *Agrobates brunescens*, Jerdon, *Mad. Jour.* No. xxv. 269. This appears to me, judging from memory, to be the *Sylvia turdoides* of Temminck, which according to that naturalist extends eastward as far as Japan. I have seen a specimen that was purchased in the London market, where, however, it may have been brought from Holland ; the species not having been hither-

\* In the same work in which Mr. Swainson has elevated the male of this bird to the rank of a different species from the female, finding, as he says, "so strong a specific distinction," he startles the common-place observer by characterising "the Spotted-winged Pintado, or Guinea-hen, (*Numida maculipennis*, Swainson). All the authors we have consulted agree," he informs us, "in stating that the common Pintado, or Guinea-fowl, has the greater quills of the wings *white*, and although we have not, at this moment, an opportunity of verifying this, *it cannot for a moment be reasonably doubted* that such is the universal character of the species (!!!). That, however, which we shall now record, has the whole of the primaries spotted on a blackish ground, precisely with the same pattern, and in the same manner, with the lesser quills. *This is the only material difference we can detect between the bird before us and the ample descriptions which have been published of the common species.* Of this latter, however, we have procured some feathers, which enable us to state, that those of the lesser quills and of the back are spotted [in a manner] precisely similar to those of our present bird. The difference, however, of the quills is *so important, that it is alone sufficient to separate them as species* ! ! ! What a pity "the first Ornithologist of any age" did not defer the publication of the above until he had visited some poulterer's shop, or farm-yard ! He would then have found that domestic Guinea-fowl with spotted primaries are at least as common as those with white ones, while among the latter he would have remarked that scarcely any two agreed in the quantity of white exhibited, a variation, too, of all others wherein any but a mere pretender to the rank of a philosophic naturalist would have paused before venturing to emburthen science after such a fashion.

to detected within the British islands. Here the present bird, which I believe to be the same, is not uncommon.

*Philopneuste fuscata*, Nobis. This appears to me to be a new species. Length  $5\frac{1}{2}$  inches, extent  $7\frac{1}{2}$  inches, wing from bend  $2\frac{1}{2}$  inches, and tail  $2\frac{1}{2}$  inches; bill to forehead  $\frac{7}{16}$  inch, and  $\frac{1}{2}$  inch to gape; tarse above  $\frac{7}{8}$  inch; 1st primary  $1\frac{1}{2}$  inch shorter, and 2nd primary  $\frac{1}{2}$  inch shorter, than the 4th, which is longest; tail slightly rounded, in which respect, as in others, this species approximates the *Salicariæ*. General colour nearly uniform dusky greenish-brown above, somewhat darker upon the crown; beneath pale, and whitish on the throat and middle of belly; shoulders of the wings beneath, and under tail-coverts, tinged with fulvous, as also the flanks slightly, and a trace of the same upon the breast and ear-coverts; a pale streak over the eye, commencing at the nostril. Irides dark brown. Bill dusky above, yellowish at base of lower mandible: inside of the mouth rather pale yellow: legs greenish-brown. Shot in the neighbourhood.

*Ibis Macei*, Cuvier and Wagler; *I. religiosa* of Sykes's catalogue, and confounded by others with the venerated Ibis of ancient Egypt, to which it is nearly allied: a male and female, of the age described as *Tantalus melanocephalus*, Latham, and figured as *Ibis melanocephalus*, Stephens, by Messrs. Jardine and Selby, *Ill. Orn.* pl. cxx.

#### *Ardea Javanica.*

Also numerous *Totani*, *Tringæ*, &c. of which the following species occur in the bazaar; those marked with a † being common to this country and the British islands. *Totanus glottoides*, very common; *T. Horsfieldi* (*Limosa Horsfieldi*, Sykes), do.; †*T. fuscus*, not rare; †*T. calidris*, very common; †*T. glareola*, excessively abundant; †*T. ochropus* and †*T. hypoleucos*, apparently rare, at least I have seen neither of these in a fresh state as yet, though we possess specimens from the neighbourhood; †*Machetes pugnax*, common; †*Tringa subarquata*, tolerably common; †*T. platyrhyncha*, rare; †*T. minuta*, exceedingly abundant; †*T. Temminckii*, not rare; *Burinatorhynchus griseus*, a specimen of this excessively rare and curious species in the Museum (vide *J. A. S.* v. 127, and *As. Res.* xix. 699); *Terekia orientalis*, occasionally met with; †*Limosa melanura*, common; †*Numenius arquatus*, do.; †*Himantopus melanopterus*, do.; †*Recurvirostra Avocetta*, not rare; †*Scolopax Gallinago*, very abundant; †*Sc. Gallinula*, much less so; *Sc. heterura*, tolerably common; *Rhynchea Capensis*, abundant (one species only); †*Squatarola cinerea*, common; *Charadrius Virginianus*, do.; (†*Ch. morinellus*, of this we have an old and much injured specimen, apparently set up when fresh;) †*Ch. minor* (v. *histiculoides*, Franklin, v. *Phillipensis*?, v. *pugillus*? Horsfield), common; another and larger species of Ring Plover, as yet undetermined, do.; *Pluvianus Goensis* and *Pl. bilobus*, not rare\*; *Parra Sinensis*, very common in the immature plumage; *P. Indica*, much less so,—the young of this has no superciliary white stripe, and otherwise differs so much from the adult that I suspected it to be distinct before procuring a specimen in transitional state of plumage; †*Fulica*

\* Since writing the above, I have met with another and (I think) a new species, *Pl. cinereus*, Nobis; and there is also an undetermined species, with very formidably spurred wings, in the Museum, which I am told is occasionally met with.



*atra*, common; †*Gallinula chloropus*, do.; *G. Javanica* v. *plumicula*, do.; *Porphyrio smaragnotus*, do.; †*Porzana maruetta* (*Gallinula porzana*, Lin.), do.; †*P. Baillonii*, do.; *P. rubiginosa*, comparatively rare; †*Rallus aquaticus*, do.; *R. Javanicus*, do.: fine picked specimens of nearly all these birds have been procured, and series of some of them illustrating their various phases.

†*Podiceps minor* has been added to the collection, which previously contained only specimens of †*P. cristatus*; the former is very common in Bengal.

Lastly, several species of *Anatidæ* have been procured, of which the following occur in the bazaars: †*Anser cinereus* (verus), not rare; *A. Indicus*, common; *Dendrocygna major*, Jerdon, somewhat rare; *D. Aowsuree* (*Mareca Aowsuree*, Sykes), abundant; *Microcygna Girra*, do.; †*Casarca rutila*, do.; †*Tadorna Bellonii*, rare; *Plectropterus melanotos*, not common; *Anas pacilorhyncha*, do.; *A. caryophyllacea*, do.; †*A. querquedula*, extremely abundant; †*A. crecca*, hardly less so; †*A. acuta*, common; †*A. Penelope*, somewhat rare; †*A. stepera*, common; †*A. chypeata*, do.\*; †*Fuligula rufina*, not rare; †*F. ferina*, do.; †*F. nyroca*, extremely common; †*F. cristata*, somewhat rare. I trust soon to have handsome and well mounted specimens of all these species in the Museum.

Altogether, 69 specimens of recently killed birds have been set up since the last meeting of the Society, in addition to some skins. Several skeletons of birds are also in process of preparation, a few being likewise included in Mr. Masters's donation. The same gentleman has also presented the Society with a few skins of birds from Tipura; consisting of common Bengalese species, with the exception of a beautiful Trogon, which I believe is the *Tr. Hodgsonii* of Mr. Gould, unfortunately, however, in very frail condition, as are also the others.

#### Reptilia, &c.

As so very many species have lately demanded my attention in the two warm-blooded classes of vertebrated animals, it will rightly be surmised that comparatively small progress has been made in investigating any other department, howsoever desirous I might feel to neglect none whatever, but to bestow the same attention upon all. This will, of course, become more practicable in process of time, when I shall have successively paid that especial attention to each class in its turn, which hitherto I have found it impossible to do in more instances than those of the Mammalia and Birds. I defer, therefore, at least as a general rule, bringing forward what observations I may have to offer relative to objects appertaining to other departments of Zoology, until such time as I shall have brought my mind to bear, for a while, exclusively upon the particular group or groups, and thus have become more familiarized with the state of knowledge concerning such in this country. On the present occasion, I have only to mention that the skin of the Crocodile noticed in my last Report has been mounted, and its bones cleaned, the latter being intended to be kept separate, for purposes of reference and comparison; and that the donation received

\* The *A. Boschæ* I have never yet obtained, nor is it included in the catalogues of Messrs. Franklin, Sykes, and Jerdon; but it is found in the Himalaya, though also unnoticed in Dr. Royle's list.



from Mr. Masters contains a stuffed skin of a small *Python Tigris*, and another of a large specimen of *Tropidonotus Dora*, or *Coluber Dora* of Russell, vel *Tr. quincunc-tatus*, Schlegel, this latter being a very common species in the neighbourhood.

In the same collection was likewise a species of Sponge : and a large Madrepora has been presented to the Society by Mr. T. P. Harding.

I am, Sir,

Yours obediently,

ED. BLYTH,

*Curator, Asiatic Society.*

Thanks were voted for the various communications.

The following are the names of the Society's Officers elected at this Meeting, for the year 1842.

*President.*

The Honorable H. T. PRINSEP, Esq.

*Vice Presidents.*

The Honorable Sir J. P. GRANT,

„ „ W. W. BIRD, Esq.

„ „ Sir H. W. SETON,

The Right Rev. the LORD BISHOP of Calcutta.

*Members.*

Major W. N. FORBES,

Dr. N. WALLICH,

Dr. J. HÄBERLIN,

Dr. H. H. SPRY,

C. HUFFNAGLE, Esq.,

Rev. J. H. PRATT,

Dr. J. T. PEARSON,

Lieut. A. BROOME,

Baboo PROSONOCOOMAR TAGORE.



# JOURNAL

OF THE

## ASIATIC SOCIETY.

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*A Geographical Notice of the Valley of Jullalabad. By Lieut. MacGREGOR,  
Political Department.*

The country which is subject to the controul of the governor of Jullalabad is the valley of the Cabul river, but it is generally termed Ningrahar or Nungnihar, the former being a corruption of the latter word, which signifies in the Affghan language, nine rivers, or rivulets, and has reference to those by which the valley is intersected.

The Khybur mountains cross the valley at its eastern end; the snowy ridge of Soofaid Koh forms its southern boundary; the hills of Kourkutchah, and Seah Koh, and the desert of Gumber trace its western limits; and on the north it is bounded by the primary and inferior ranges of the Safee and Momund hills, which are separated by the Koshkote river.

The Cabul river flows through the northern part of the valley, and its direction is east by south, and west by north. On its left bank from Salpoorah to Kama, a distance of about thirty-five miles, lie the Momund (Bé-doulut) hills. In some places they form ridges, which advance and overhang its banks, and then bend back, and form the plains of Goshta and Kama; at the confluence of the Koshkote and Cabul rivers the valley opens out to the north, and forms the fertile districts of Shiwah, Shegee and Beysoot; the two latter are divided by

a low ridge of barren hills, called Tungee Phagoo. The northern boundary of Shiwah, which skirts the Safee hills, may be estimated at fifteen miles from the left bank of the Cabul river, and the mean width of these districts, limited on the east by the Koshkote river, and on the west by the Gumbeer desert, at six miles. This part of the valley is not generally considered as belonging to Nungnihar, but as it bears on the Koshkote river, which is one of those that give origin to the term, it seems to me, to be very properly included under the denomination.

On the south side of the Cabul river are the plains of Jullalabad Chardeh, Buttee Kote, Besh Boolay and Dukka. The first mentioned are divided by the Alee Boghan hills, termed by the natives Soork Dewar, these cross the valley and form a low connecting ridge between the Momund hills and the Soofaid Koh. The plain of Buttee Kote is joined on the north by that of Chardeh, and the country to the south of it, and of the plain of Jullalabad, slants up to the base of the Soofaid Koh. Besh Boolay is included in this highland, which Lieut. Wood, of the Indian Navy, describes as embracing all the rough and broken ground between the Khybur and Kurkutchah ranges, and estimates its length at fifty-nine miles, and its mean width at fifteen.

The small plain of Dukka lies on the western entrance of the Khybur pass, the Cabul river marks its northern boundary; it is enclosed on all other sides by the inferior ranges of the Khybur hills (Khoond Khybur): the high road from Dukka to Jullalabad defiles westerly through the hills, and at the narrow part of the pass, a thanah of Momunda is stationed for the protection of travellers; on debouching from the defile, the road leads out on the Geerde country, passes on to Huzurnow and Bursawul and opens out on the valleys of Buttee Kote and Chardeh.

The plain of Buttee Kote is little else than a stony desert, that of Chardeh is more fertile, on the north of which flows the Cabul river; Márkoh, or serpent hill, limits its eastern boundary; on its west are the Ali Baghan hills, and south lies the Buttee Kote desert; its length may be estimated at nine miles and mean width at three and a half.

To describe the plain of Jullalabad, I will quote from Lieutenant Wood's report on this part of the country, submitted to Government in 1833.

"A ridge of hills called Deh Koh, or the Black, rises about Jugdulluk, and running east by north till it meets the Cabul river, bounds the plain of Jullalabad on the north; to the south it has the high hill of Nungnihar; east it has the hills of Alee Baghan and desert of Buttee Kote; while its western limit is marked by ridges, which here project into the valley of the Soorkh Rood."

"The length of the Jullalabad plain is twenty-five miles, and its width does not exceed four miles. A plain situated so high up the temperate zone, with snowy mountains in sight on the north and south, producing all the vegetable productions of a more southern clime, is one of these exceptions, resulting from local influences, that are often found to militate against received opinions regarding climate. From Jullalabad to Gundummuk, the distance is twenty-eight miles, and the difference in the elevation of the two places is 2330 feet, the former being 2170 feet above the sea, and the latter 4150. Travelling from the plain of Jullalabad, the change from a hot to a cold climate is first perceived at Gundummuk; so sudden is the transition, that natives affirm it snows on one side, while rain falls on the opposite."

The following rivers intersect Nungnihar :—

- |         |                                   |
|---------|-----------------------------------|
| Rivers. | 1. The Soorkh Rood, or red river. |
|         | 2. The Gundummuk river.           |
|         | 3. The Kurrusso ditto.            |
|         | 4. The Chipreeal ditto.           |
|         | 5. The Hisaruk ditto.             |
|         | 6. The Kote ditto.                |
|         | 7. The river of Momund-durrah.    |
|         | 8. The Koshkóte.                  |
|         | 9. Cabul river.                   |

The Soorkh Rood rises in Bara Koh, flows through the Hisaruk district, joins the Gundummuk river at Tuttungi Mahomed Acbar, and falls into the Cabul river at

Darrounta. It is called the red river, from the colour of its water; it is fed by tributary streams at Tootoo, Baghwanee, Tuttung, and Bala Bagh. The Soorkh Rood is not navigable.

The Gundummuk river rises in the Soofaid Koh; it is joined by streams from Moonkhee Kheil and Koodee Kheil; it  
 Gundummuk River. flows by Gundummuk, and falls into the Soorkh Rood at Killa-Alladad-Khan; it is not navigable.

The Kurruso river rises in the Soofaid Koh, runs through the valley of the Wuzzeeree Khoogeeanee, passes Kujja,  
 Kurruso River. Behoor, and Futtihabad, and flows into the Soorkh Rood, close to the town of Bala Bagh.

The Chipreeal river rises in the Soofaid Koh, a little about Pucheca, flows by Agan, Chipreeal, and Heidah, and joins the  
 Chipreeal River. Cabul river, about four miles to the eastward of Jullalabad at Serai-i-Khoosh Goombuz.

The Hisaruk, like the rest rises in the Soofaid Koh, above Muzeena, runs past Hisarshae, Burroo and Bareekal, travels on  
 Hisaruk River. to Chardeh, and sinks into the Cabul river at Lachoopoor.

The Kote river rises in the Soofaid Koh, its course is by Khunder Khanee, Buttee Kote, Chardeh, and falls into the  
 River Kote. Cabul river at Killa-i-Khalid-Khan.

The river of Momund Durra rises in a valley, from which it takes the name, and which is situated among the inner ranges  
 Momund River. of Soofaid Koh; this river flows past the Nāzeean valley, and the Sheinwāree forts of Beah Boolag, it branches into two streams near Busawul, the larger one falls into the Cabul river at Busawul, and the smaller one flows in the direction of Huzārnow, and exhausts itself on the cultivation appertaining to that place. This river forms the limit of the Cabul valley on the south-eastern side, paying revenue to the Government.

The Kashkote river is said to rise near the source of the Oxus, it flows through Kashgar, Chughurserai, Koonur and  
 Kashkote River. Kashkote, and joins the Cabul river near the village of Kama. During the summer, on the melting of the snow of the Safee mountains, this river is not fordable. Timbers are floated down from Chughurserai, Koonur, and the Safee valleys to Jullalabad. Rafts of inflated cow hides also float down the river, bringing grain, iron, and other articles, supplied from the Bajore and Koonur countries.

The Cabul river in its course receives several considerable rivers, the Punjsheer, Ghorebund, and Loghur streams, besides Cabul River.

those intersecting this valley are its tributaries; in summer it flows with great violence; it is fordable only from November to April. Rafts of inflated hides float with the current, and convey people and goods from Jullalabad to Peshawur. Rafts cannot stem the current. On the journey down the river being accomplished, the raftsmen take the hides out of the water, allow the inflated air to escape, pack up the hides, and return with them by land, either laden on, jackasses, or upon their own shoulders.

These streams, with the exception of the Soorkh Rood, Kashkote, and Cabul rivers are more properly termed rivulets, they are chiefly fed by the melting snows of the Soofaid Koh: canals conduct their waters over the country through which they flow, and spread fertility wherever their influence extends. Several of these streams, during the summer at the period of the rice cultivation, are exhausted before they reach the Soork Rood or Cabul river, to either of which, at other seasons, they form tributaries.

The distance of Dukka to Soorkhal, by the high road is  $77\frac{1}{2}$  miles, vide subjoined table of routes furnished me by Captain Paton.

The low hills of Jullalabad are extremely barren, but the lofty ranges of Koond, Kurkutch, and Soofaid Koh, are richly clad with pine, almond, and other trees, which supply the market with excellent timber.

The highest peak of Speenghir or Soofaid Koh, is stated by Lieut. Wood, at 14,100 feet above the level of the sea. The same officer talking of the people who inhabit the hilly country, says, "To see a stream well-conducted along the face of a hill twenty-five feet above the mean level of the valley below is not uncommon, and where no rivulets intersect the valleys, a running stream is procured from *kar-kezes*, or wells. The appearance of these sequestered valleys is a mixture of orchard, field, and garden. They abound in mulberry, pomegranate, and other fruit trees, while the banks of their streams are edged with a fine healthy sward, enamelled with a profusion of wild flowers, and fragrant from aromatic herbs; near the forts they are often fringed by rows of weeping willows."

The plains of Buttee Kote, Geedee Goshta, Chardeh, Lookhee, and the country skirting the hills, afford good pasturage. The pastoral





## 2

1.	Sooltanpoor,	..	..	..	..	..	8
2.	Futtihabad, ..	..	..	..	..	..	7
3.	Neemlah, ..	..	..	..	..	..	9
4.	Gundummuk,	..	..	..	..	..	6½
5.	Soorkhab, ..	..	..	..	..	..	7½

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 38
*History.*

As far back as A. D. 977, we find that Nungnihar was the scene of contention between Sabuctagi, the Tartar, who assumed the title of Nasir-ood-deen, and Jeipal the Brahmin prince. History mentions that their armies came in sight of each other, on the confines of Lingān, now called Lughman, and the present village of Futtihabad is said to mark the spot where a victory was gained by Subuctagi over the Hindoo prince. His subsequent defeat and imprisonment took place at Peshawur.

Sooltan Babur in his memoirs, thus mentions Nungnihar in the year A. D. 1504 :—

“Nungnihar,” he says, “in many histories is written Nekerhar. The residence of the darogha, or commandant of this district is Adinapoor : Nungnihar lies to the east of Cabul, thirteen farsangs of very difficult road. In three or four places there are some very short kotuls, or steep hill passes, and in two or three places, there are narrows or straits ; the Khiralchi, and other robber Afghan tribes, infest this road with their depredations. There was no population along this road until I settled Kuratur below the Kurruksai, which rendered the road safe. The Gurmsil, (or region of warm temperature,) is divided from the Sersil, (or region of cold temperature,) only by the steep pass of Badām Chesmeh. Snow falls on the Cabul side of this pass, but not on the Kurruksai and Lumghanat side ; the moment you descend this hill pass, you see quite another world. Its timber is different, its grains are of another sort, its animals of a different species, and the manners and customs of the inhabitants are of a different kind. Nungnihar has nine streams. Its rice and wheat are excellent ; oranges, citrons and pomegranates are very abundant, and of good quality. Opposite to the fort of Adinapoor to the south, on a rising ground, I formed a Char

Bagh, (a great garden,) in the year 914, (A. D. 1508.) It is called Bagh Vafâ, (the garden of fidelity) ; it overlooks the river, which flows between the fort and the palace. In the year in which I defeated Behar Khan, and conquered Lahore and Dibalpoor, I brought plaintains and planted them there, they grew and thrived ! The year before I had also planted the sugar cane in it, which throve remarkably well. It is on an elevated site, enjoys running water, and the climate in the winter season is temperate ; the garden is charmingly laid out ; to the south lies Soofaid Koh, which separates Bungush from Nungnihar. Nine streams descend from the mountain ; the snow on its summit never diminishes. On the skirts of the hill there are many airy and beautiful situations. On the south of the fort is Adinapoor. The tomb of holy law, the father of Nuh, is in the Toomân of Alishung. In some histories, the holy law is denominated Lamek and Lamekan. The people of the country have a general practice of changing the letter Kâf into Ghain, and it seems very probable that the name Lamghan originated in that circumstance.

“ The Tooman of Nungnihar, Manderam, Dereh Noor, Dereh Kooner, Noorgie, and Cheghurserai, I gave to Nasir Mirza.

“ I marched from Jumdool for the purpose of attacking Bajore. Having encamped near it, I sent a trusty man to  
3d. Jan. A. D. 1519. require the Sooltan of Bajore and his people to submit, and deliver up the fort. That stupid and ill-fated people refused to do as they were advised, and sent back an absurd answer. I therefore ordered the army to prepare their besieging implements, scaling ladders, and engines for attacking the fortress. The preparations having been completed, it was luncheon time when the tower was breached, immediately on which the assailants drove the enemy before them, and entered the tower. The men of the main body at the same time also mounted by their scaling ladders, and entered the fort. By the favour and kindness of God, in the course of two or three hours, we took this strong castle, (Naogee.) As the men of Bajore were rebels to the followers of Islam, and beside their rebellion and hostility, they followed the customs and usages of the infidels, while even the name of Islam was extirpated from among them ; they were all put to the sword, and their wives and families made prisoners. I bestowed the country of Bajore on Khwajeh Kilan.

"In the hill country all the inhabitants are *kafirs*: in Kafirstan grapes and fruits are extremely abundant, and it produces a great quantity of wine, but in making, they boil it. In the hills of this district they have the pine, the jilguzeh, the oak, and the mastic tree in great abundance.

"I embarked on a raft, and passing the Strait of Darounta, landed higher up than Jehan-numai; we went to the Baghi  
7th Jan. A. D. 1520. Vafā, which is opposite Adinapoor. Kiam Urdooshah, the hakim of Nungnihar, met us as we landed from the raft."

On the events of the year 1525, Babur writes, "On the 8th of Sefer, (November 24th) in halting at Gundummuk, I had a severe defluxion,\* but by the mercy of God it passed off without bad effects. On Saturday I halted at the Bagh-i-Vafā, where I was forced to wait nine days for Hoomaiun, and the army that was with him; the garden was in great glory, it is a charming place; the few days we staid there we drank a great quantity of wine. On Sunday the 17th, Hoomaiun arrived, that evening we marched, and halted at a new garden, which I laid out between Sooltanpoor and Khwajeh Rustam.

"On Wednesday, we marched thence, when I embarked on a raft, on which I proceeded down the river, drinking all the way till we reached Kosh Goombuz, where I landed and joined the camp." Babur proceeded to Peshawur, (Begram.)

In the year 1570, Jullalooden Mahomed Akbar Badshah, when proceeding from Cabul to India, desired Shumshooden Khaffee to build the towns of Jullalabad and Attock, and which were completed in two years. His son Selim, (Jehanghire,) was for some time acting governor of Jullalabad.

The historian, Abdool Kadir Budwanee, in confirmation of the above, states, "On the banks of the Nilah, Akbar Badshah desired the town of Jullalabad to be built: about three coss from the town is the Bagh-i-Sufa, commonly called Char Bagh, formerly known as the Bagh-i-wufa, made by Sooltan Babur, near which was Adinapoor, the place where the governor resided." The same author says, "That Nungnihar in former times was known by the name of the Joo-i-Shaee."

During Shah Jehan's reign, that monarch made some additions to the

\* A complaint very prevalent in the summer of 1840, among the British Troops at Kajja and Gundummuk.

town. The following is an inscription on a marble slab, taken from an old fort, and placed in the principal *mosjid* of the town, shewing that the fort was built by Itimam Khan, in Shah Jehan's reign, A. D. 1638 :—

بحکم شاه جهان اہتمام خان چونہاد بروی ساحت دیرین بنای  
خیرمال زاسمان زمان تا اثر بود پیدا مباد خوبی این قلعه در شکنج  
زوال حساب سال بنایش زحقل میچستم ندارسید بکوشم بنای فروخ  
قال سنہ ۱۰۵۴

In the year A. D. 1735, Nadir Shah sent Sooliman Yeesawul, (stick bearer,) from Cabul, at the head of a mission to Mahomed Shah of Delhi. On the fifth day, Sooliman and his party reached Jullalabad. Abaidollah, the son of Meer Abbas of Kooner, whose power extended over the whole of Nungnihar, desired Sooliman to be slain, and he was killed with much cruelty. Nadir Shah on hearing of the treatment that Sooliman had met with, immediately left Cabul with his army, and marched to Gundummuk viâ Chareekur, Nijral, and Tugore; thence he sent on to Jullalabad, Sirdars Jillayēr and Vyaz, with the vanguard. Abaidollah evacuated Jullalabad, and fled to Kooner: he was pursued by the Sirdars, and fled to Swât. Many of his followers were slain, and his sister and women made prisoners, and brought to Nadir Shah.

The monarch with his main army went from Gundummuk, (where he describes the water to be good, and the air delightful,) to Behai; thence to Jullalabad, where he remained only thirty-one days, his Sirdars mean while having captured Kooner and Bajore. He proceeded viâ Chara to Peshawur, where Naisir Khan, the governor, submitted without making any defence.

To enumerate all the important events which have taken place in this district since that period, would take up too much space. I will only briefly allude to a few of them.

On the 10th of September 1801, Shooja-ool-moolk marched from Peshawur to attack Cabool. At Heshpan, he found  
A. D. 1801. Mahmood's force, consisting of three thousand men drawn up, the Soorkh Rood being in their front.

Elphinstone thus describes the battle: "Shooja had at this time at least 10,000 men, but they were Burdooranees, and though accustomed

to the battles of their clans, they were strangers to discipline and to regular warfare. Shooja's arms were at first victorious, but his Burdooranee troops eager to profit by the confusion, quitted their line as soon as they thought the victory decided, and began to plunder the royal treasures, which Shooja had imprudently brought into the field. Futteh Khan seized this opportunity, and charging at the head of his Baurikzyes, completed the confusion in Shooja's army; the battle was now decided, and Shooja escaped with some difficulty to the Khyber.

“ In the year A. D. 1809, June 29th, Shah Shooja sustained another  
A. D. 1809. defeat at Neemla, when opposed to Mahmood Shah and his minister Futteh Khan. Akram Khan, Shah Shooja's prime minister, was slain in this battle. Shah Shooja fled over the mountains south of the Khybur pass to Hisaruk.”

On Zuman Shah's defeat near Sireeasp, he fled to the Jullalabad valley, and stopped at Mollah Ashuk's fort, which is on the Chipreeāl rivulet, about 14 miles from the town of Jullalabad, near the Soofaid Koh. “The Mullah received them hospitably, but took means to prevent their escape, and sent off a messenger to Mahmood Shah. Shah Zuman, during his confinement, secreted the Koh-i-Noor with some other jewels in the wall of his apartment, which were afterwards found on Shooja's accession,” (Elphinstone.) The poor monarch was blinded on his road to Cabul, by piercing his eyes with a lancet.

On Shah Shooja being restored to his throne, the first step he took was to release his brother Shah Zuman, and soon after Mollah Ashuk, who had betrayed him was apprehended, and suffered the punishment of his perfidy and ingratitude.

When the Baurikzye Khans gained the ascendancy over the Dooranee monarchs, Azeem Khan placed his nephew Nuwab Zuman Khan in the government of Nungnihar, and from the time of Azeem Khan's death, 1823, until the year 1834, the Nuwab enjoyed the entire government collections of the province. Dost Mahomed insisted upon a portion of them being made over to him; this the Nuwab refused. The Ameer collected a force, and marched against him, and on his approach, the Nuwab withdrew his guns to Kameh, and there took up a position near Abdoo Ruhman's fort; negotiations took place between the contending parties. The Nuwab having made some slight sacrifice of his interests, Dost Mahomed returned to Cabool.

The Nuwab then commenced fortifying the town of Jullalabad, the old fortifications were nearly 'on a level with the ground; a great number of people were collected for the purpose, the work advanced rapidly, but ere a month had elapsed, the Ameer was again on his march to Jullalabad, and the fort was still incomplete. The Nuwab, however, determined to defend it. After three days' resistance, a mine was sprung, the town was taken by assault, and it was given up to plunder. The Nuwab was taken prisoner and displaced from power, and Sooltanpoor, and the transit duties of Cabool were made over to him for his maintenance. Dost Mahomed's brother, Ameer Mahomed, remained a short time in charge of the province. He was succeeded by the Ameer's son, Mahomed Afzool, who was recalled after a few months, and succeeded by his younger brother, Akbar; he continued in charge until the arrival, in 1839, of the British troops. Mirza Aga Jan, a Kazzilbash, was then, on the part of the Shah, appointed governor, and still continues so.

There are topes and extensive ruins to be found scattered over the valley, which if explored attentively by learned antiquarians, would no doubt reward them for their labours.

There are now no perfect buildings of any size, beauty, or antiquity in the valley.

The royal gardens of Char Bagh, Baghwanee, Bala Bagh, Neemla, and Gundummuk, laid out by Sooltan Babur and Alee-muridan, and renewed by Timoor Shah and Shah Zuman, during the Baurikzye rule, were quite neglected.

The Gundummuk garden has been quite destroyed; the fine old plane trees were cut down by Sirdar Mahomed Akbar's order to build the fort of Futtung, at the confluence of the Soork Rood and Gundummuk rivers. The fort would be found strong against Afghan troops without artillery.

There is a *zearat* at Char Bagh, to which Moosalmans and Hindoos go to pray. The former suppose it to be the tomb of Shah Fyzoolah Wullee, the cup-bearer of Mahomed the prophet; the Hindoos, on the other hand, imagine it to be the resting place of Hajee Ruttun, a *fuqueer* of great sanctity and note. There is also a large Hindoo temple in the town of Jullalabad, inhabited by a supposed descendant of Ruttun. Hindoos in great numbers come from Peshawur, and

other places, to make him offerings, which are said to amount to the large sum of 40,000 rupees annually.

In the neighbourhood of Jullalabad there is also Shah Murdan's *searut*, held sacred under the supposition that Alee, the son-in-law of Mahomed rested there; and in the temple is exhibited a large black stone, shewing an impression of the hand of Alee. A garden is attached to the *searut*, where a fair is held every Thursday, to which crowds from the town and camp resort. Nazir Hussan, formerly in the service of Nuwab Zuman Khan, is now expending his money on the *searut*, and garden. The *searut* was originally raised by Abdoola Khan Khafir, in the reign of Timour Shah.

Of late years, the following persons filled the office of governor of Jullalabad :—

<i>Governors.</i>	<i>In whose reign.</i>
Adool Khan Khafir, . . . . .	Timour Shah.
Meerdad Khan, Isakzye, . . . . .	Ditto.
Ghunnee Khan, . . . . .	Ditto.
Gool Mahomed Khan, Gurdeezye,..	Zuman Shah.
Causim Khan, Moghul, . . . . .	Ditto.
Baba Khan Afshar, . . . . .	Ditto.
Meer Alee Khan, . . . . .	Ditto.
Golam Alee, . . . . .	Ditto.
Shurreef Khan, . . . . .	Shah Shooja.
Ibrahim Khan, Jumsheeree, . . . . .	Mahmood Shah
Shehur Dil Khan, Baurikzye, . . . .	Mahomed Azeem Khan.
Shukoor Khan, ditto, . . . . .	Ditto.
Moghul Khan, . . . . .	Ditto.
Nuwab Zuman Khan, . . . . .	Ditto.
Ameer Mahomed Khan, . . . . .	Dost Mahomed.
Mahomed Afgool, . . . . .	Ditto.
Mahomed Akbar, . . . . .	Ditto.
Meer Aga Jan, . . . . .	Shah Shooja.

*Weights, Measures, &c.*

The land revenue in kind is collected in Tabreez weight, and the money taxes in the nominal Tabreez (Khan) rupee.

*Tabreez Weight.*

2½ Charuks, . . . .	=	1 Mun-i-Tabreez.
100 Mun-i-Tabreez,	=	2 Kharwa-i-Tabreez.
1 Kharwa-i-Tabreez,	=	10 Maunds Hindoostanee,
100 Kharwa-i-Tabreez,	=	1000 Maunds Hindoostanee,

*Coin Table.*

10 Shahees, . . . .	=	1 Rupee Khawa.
20 Rupees Khawa,	=	1 Tooman Tabreez.
1 Tooman Tabreez,	=	Company's Rs. 14 9 4.
100 Tomans-i-Tabreez,	=	Ditto. . . 145 5 4.
100 Toomans-i-ditto,	=	Ditto. . . 14,583 5 4.

*Second Notice of some new Bactrian Coins. By Lieutenant A.  
CUNNINGHAM.*

When I published my last paper on this subject, I was able to add but one new Prince to our already long list of Bactrian Sovereigns. Through the kindness of several gentlemen, I can now make known no less than eight new names, of which six are pure Greek, and the other two genuine Parthian. In addition to these, I am able to make public a second Copper Coin of Demetrius; and a new Drachma of Azas of a type already known on the drachmas of Vonones.

No. 1.—A round Copper Coin of middle size, weighing 106 grains. This specimen from my own cabinet, and a duplicate in the possession of Lieut. Combe, were originally procured by Capt. Hay; one at Bamian, and the other in the Punjab; but the latter was also said to have come from Bamian.

*Obv.\** Bearded head of Hercules to the right, with the club behind. The sketch was made from a sealing-wax impression, on which I did not observe the club: it is, however, quite distinct on the coin.

*Rev.* Hercules naked, standing full face, holding his club, and lion's skin on his left hand, and crowning himself with his right hand. Greek legend in two perpendicular lines ΒΑΣΙΛΕΩΣ ΔΗΜΗΤΡΙΟΥ  
“(Coin) of King Demetrius.”

\* “The sketch of No. 1 was made from a sealing wax impression which had become flattened on its way from Bamian. The coin itself is now in my own possession, and the beard is perfectly distinct upon it; as well as upon the more beautiful duplicate in Lieutenant Combe's Cabinet.”



No. 2.—A round Copper Coin of large size, in the possession of Lieut. Combe, who obtained it from Capt. Hay. This piece has already been published, but as the sketch given in the *Journal*, No. 97 was very imperfect, I thought that the publication of a more distinct outline would be a service rendered to all lovers of numismatic science.

*Obv.* An Elephant's head to the right, with a bell suspended from its neck.

*Rev.* The Caduceus—Greek legend in two perpendicular lines as on No. 1.

On this highly interesting piece, we see the Elephant's head, which on the silver coins forms only the King's head dress, occupying the whole field of the coin. It is no doubt an emblem of the conquests of Demetrius in India.

No. 3.—A square Copper Coin of small size, in the possession of Lieut. Combe.

*Obv.* Apollo standing naked, holding in his left hand a bow which rests on the ground, and in his right hand an arrow with the point directed downwards. Greek legend on three sides ΒΑΣΙΛΕΩΣ ΜΑΥΟΥ “(Coin) of King Maas.”

*Rev.* A tripod. Ariano-Pali legend on three sides *Maharajasa Moas*, “Coin of the Great King Moas.” This is the only coin of Moas which has *Maharaja*, his title always being *rajadiraja*.

The name of this King has hitherto been read as Mayes; which is in accordance with the Greek version: but the Pali gives *Moasa* unequivocally; and as the name is not a Greek one, we can have no hesitation in preferring the native reading. The Greek would more properly have been rendered ΜΩΟΥ.

No. 4.—A square Copper Coin of large size, weighing 143 grains. Five other specimens of this coin are in existence in different cabinets. They are all found between Peshawur and the Jehlum.

*Obv.* Apollo standing naked, inclined to the left; holding in his left hand a bow which rests on the ground, and in his right hand an arrow pointed downwards. Greek legend on three sides ΒΑΣΙΛΕΩΣ ΕΠΙΦΑΝΟΥΣ ΣΩΤΗΡΟΣ ΣΤΡΑΤΩΝΟΣ “(Coin) of the King, the illustrious Saviour Strato.”

*Rev.* A tripod surrounded on three sides by dotted lines. Grecian monogram in the field to the left, forming ΔΗΜΗΤ, probably for

ΔΗΜΗΤΡΙΑΣ, the place of mintage. Ariano-Pali legend on three sides *Maharajasa téjamasa tádatasa státasa*. “ (Coin) of the Great King, the illustrious Saviour Strato.”

The title of Epiphanes, which now appears for the first time on a Bactrian coin, is rendered in Pali by *téjamasa*, which I believe to be the Pali form of the Sanskrit *tejomayasya*; तेजोमय means made of splendor. Professor Lassen however thinks that the affix is the Sanskrit मत्, abbreviated into मः *téjama* would in this way be the same as the Sanscrit तजोवत् “possessing light.”

No. 5.—A square Copper Coin of middle size in the possession of Lieut. Combe. A duplicate in my own cabinet weighs 122 grains.

*Obv.* Male head diademed (and perhaps bearded) to the right, with a club over the shoulder. This may be either the head of Hercules himself, or of the king as Hercules. Greek legend on three sides ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΣΤΡΑΤΩΝΟΣ “ (Coin) of the Saviour King Strato.”

*Rev.* Victory to the right holding out a chaplet in her right hand. Grecian monogram in the field as on the last. Ariano-Pali legend on three sides *Maharajasa tádatasa státasa*. “ (Coin) of the great King, the Saviour Strato.”

Dr. Chapman has a coin of similar type to the preceding, but with the addition of ΔΙΚΑΙΟΥ in the Greek legend; and of *dhamikasa* in the Pali: and this is the identical legend which is found on the reverse of Dr. Swiney's coin of the “godlike-minded Queen Agathoclea.” There can be no doubt therefore that she was the Queen of Strato, Dikaius, Epiphanes, Soter.

No 6.—A round Plated Coin of small size in my own possession.

*Obv.* Bare and beardless head of the King to the right, resting upon what would appear to be a crescent. Greek legend much obliterated βασιλε ΩΣ ΣΩΤΗΡΟΣ \* \* \* \* \* “ (Coin) of the Saviour King \* \* \* \* \*”

*Rev.* A rude figure of Minerva Promachus to the left. Ariano-Pali legend \* \* \* \* *tádatasa strátasa*. “ (Coin) of the \* \* \* \* the Saviour Strato.”

I am uncertain whether this coin should be attributed to Strato or to Hippostratus. The type of Minerva Promachus, and the bust, which are found on a true drachma of Strato in the possession of Mr. E.

Thomas, C. S. would seem to give it to the former prince; but the St. of the Pali is so immediately under the figure of Minerva, that it would appear not to be the commencement of the name.

No. 7.—A Seal in the possession of Mr. V. Tregear. I have introduced this seal here, because its subject is similar to the type on the obverse of the next coin.

No. 8.—A round Silver Drachma, weighing 37 grains, procured by Lieut. Combe at Peshawur.

The original owner must have kept impressions of the genuine coin; for since Lieut. Combe's acquisition of it, I have obtained a silver forgery of this coin from Peshawur, which has evidently been cast from an impression of the genuine coin. The foregoing weighs 49 grains, and is considerably larger than the original coin. This is even evident from an examination of the cast alone, on which a circular line is clearly distinct, running through the letters of the title in the Pali legend; which are thus made only half letters, while there is more than sufficient room for them upon the forged piece.

*Obv.* An ancient giant full front, with snaky legs, which curl upwards on each side. Greek legend around the piece ΒΑΣΙΛΕΩΣ ΕΥΕΡΓΕΤΟΥ ΤΗΛΕΦΟΥ “(Coin) of the king, the beneficent Telephus.”

*Rev.* A draped male figure standing to the left, his head crowned with rays, and holding in his right hand a spear: to the right a clothed female figure with a crescent on her head. These figures are no doubt the Sun and Moon. Greek monogram in the field to the right, forming ΔΙΚ. Ariano-Pali legend around the piece, *Maharajasa \* \* \* karmasa Téliphasa*. “(Coin) of the great king, the beneficent Telephus.”

The Pali version of Euergetes is unfortunately too imperfect to be made out satisfactorily, it ends however with *karmasa*; and *Su-karmasa* would be “well-doer,” a literal translation of the Greek-Euergetes: but there are three letters before *Karmasa*, of which the first looks like a *p*. *Parakarmasa* would be “best-doer,” and might for an oriental exaggeration of Euergetes.

No. 9. A square Copper Coin of middle size, in two pieces, from the cabinet of Mr. W. J. Conolly, C. S.

*Obv.* The Olympian Jupiter seated in a high-backed chair, his right hand extended to the right. Greek legend on three sides ΒΑΣΙΛΕΩΣ

ΣΩΤΗΡΟΣ ΙΠΠΟΣΤΡΑΤΟΥ. “ (Coin) of the King, the Saviour Hippostratus.”

*Rev.* A horse to the left. Grecian monogram in the field. Ariano-Pali legend on three sides, *Maharajasa tadarasa jaya (dharasa) Hi)pástata*. “ (Coin) of the King, the Saviour, the victorious Hippostratus.”

Dr. Chapman possesses a large square copper coin of this Prince, of a different type, having a giant with snaky legs as on the drachma of Telephus. Three specimens of a third type of Hippostratus are likewise known in Dr. Chapman's, Lieut. Combe's, and my own cabinets, having Apollo and the tripod, as on the coin of Strato No. 4. On all of these coins we find the title of Soter only; but on the coin sketched in the plate, the Ariano-Pali legend gives the commencement of the title of *jayadharasa*, which is used indifferently for the Greek Nicator, and Nicephorus.

No. 10. A round Drachma of Azas in my own possession. I have introduced this coin here, because the type of the reverse is different from any yet described on the coins of this Prince. Jupiter appears standing full front, grasping a thunderbolt in his right hand, and holding a long sceptre or a spear in his left hand. This type is the same as that of the drachmas of Vonones.

No. 11. A round Copper Coin of middle size, in the possession of Colonel Stacy. A sketch of this piece has already appeared in the *Bengal Journal*, vol. viii. for April.

*Obv.* King's head diademed and bearded to the left; the hair arranged in large massy curls; the neck and shoulders draped and ornamented with strings of jewels. Corrupted Greek legend, as read by Colonel Stacy, ΒΑΣΙΛΕΥΣ ΒΑΣΙ (λεων μεγ) ΑΣ ΠΑΚΟΡΗΣ. “ The great king of kings, Pakores.”

*Rev.* A winged Victory to the right, holding out a chaplet in her right hand. Ariano-Pali legend *Ma(harajasa) rajadhirajasa mahatasa Pakorasa*. “ (Coin) of the great king, the king of kings, the mighty Pakores.” The coins of Gondophares or Undapherras bear precisely the same type, a bust and Victory; but on the coins of Pakores, there is a remarkable change observable in the Pali characters, each letter having an angular foot-stroke added to the left. These ornamental additions to the Pali characters prove that the coins of Pakores are of a later date than those of Gondophares and of his nephew Abdgases, on which the

Pali is of the simple form. The Greek legend too which is in the nominative case, betrays an era certainly later than the earlier coins of Undapherras, and about contemporary with the coins of the nameless Prince **BACIAEVC BACIAEWN COTHP METAC.**

If this coin is to be attributed to the Parthian Pakores, its date will lie between A. D. 90—107 : but I incline to believe that our Pakores whose coins are found in Sistán, the, ancient Drangiana, was a different Prince. Persian tradition is uniform in its mention of two distinct Parthian dynasties, the Ashkanians, and the Ashganians, who were contemporary with each other. Ashg, the founder of the Ashganians, was a descendant of Kai Kaoos ; and Khoosroo, the grandson of Ashg, was reigning when our Saviour was born. This will make the date of the rise of the Ashganians about 30 B. C. To the founder of the Ashganians I attribute the following coins of copper.

1st *Obv.* A horseman to the right. Greek legend **BACIAEVONTOS BACIAEWN ΔΙΚΑΙΟΥ ΑΡΣΑΚΟΥ.** “ Coin of the governing over kings, the just Arsaces.”

*Rev.* Type obliterated. Ariano-Pali legend *Maharajasa rajarajasa mahatasa Ashshakasa tddatasa.* “ (Coin) of the great king, the king of kings, the mighty Ashshak, the Saviour.”

2nd *Obv.* A horseman to the right. Greek legend imperfect **ΒΑΣΙ.....ΟΥ ΑΡΣΑΚΟΥ.** “ (Coin) of the king of kings, \* \* \* \* Arsaces.”

*Rev.* Male figure to the left, holding out a small figure (apparently Victory) in his right hand. Ariano-Pali legend imperfect. *Maharajajasa ? \* \* \* A (shshakaia.)* “ (Coin) of the great king of kings, \* \* \* \* Arsaces.”

I have in my possession the coins of two or three other Princes of this dynasty, but the names are unfortunately too much obliterated to be satisfactorily decyphered. One of them appears to be Orthamasdes.

I have now made known the names of three Greek Princes, Strato, Telephus, and Hippostratus ; and of two Parthians, Arsaces and Pakores. To these I will add two Grecian kings, Dionysius and Nicias ; and one Grecian Queen, Calliope, to make up the eight new names which I mentioned in the beginning of this account.

*Dionysius.* A square Copper of middle size, formerly belonging to

Captain Hay, but now in the possession of Lieut. Combe. There is also a duplicate in Dr. Chapman's cabinet, which I have not yet seen.

*Obv.* Apollo standing naked as on the round copper coins of Apollodotus. Greek legend on three sides, ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΔΙΟΝΥΣΙΟΥ ; “ (Coin) of the king, the Saviour Dionysius.”

*Rev.* A tripod. Ariano-Pali legend imperfect, \* \* \* \* *sa Dianisayasa*. I am by no means confident of the correctness of the Pali version, for the coin was in a very imperfect state. Dr. Chapman's coin is, I believe, in much better preservation ; and I hope hereafter to lay before the public a sketch and description of his duplicate.

*Nicias.* A square Copper Piece of middle size, in the possession of Lieut. Combe.

*Obv.* Bust of the king diademed and beardless to the . Grecian legend on three sides, ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΝΙΚΙΟΥ “ (Coin) of the king, the Saviour Nicias.”

*Rev.* A horseman to the right, as on the silver coins of Antimachus. Ariano-Pali legend on three sides, *Maharajasa tādātasa (Ni) kiasa* : “ (Coin) of the great king, the Saviour, Nicias.”

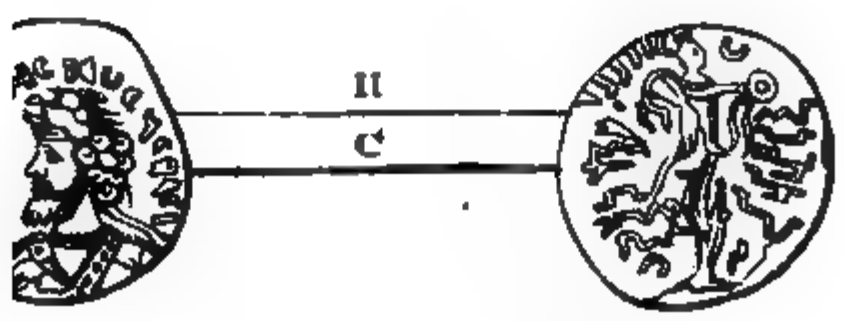
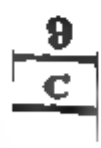
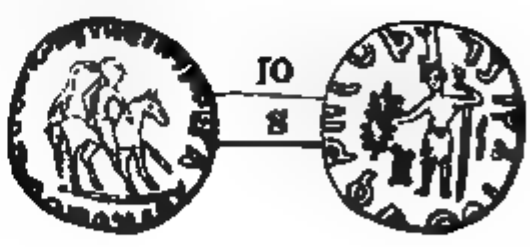
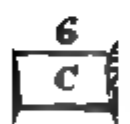
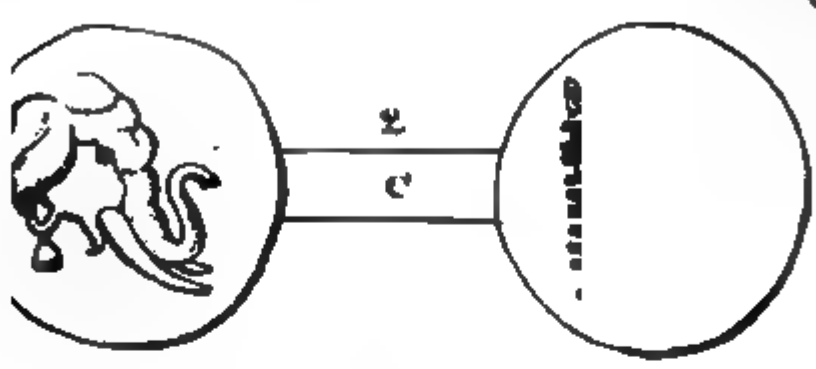
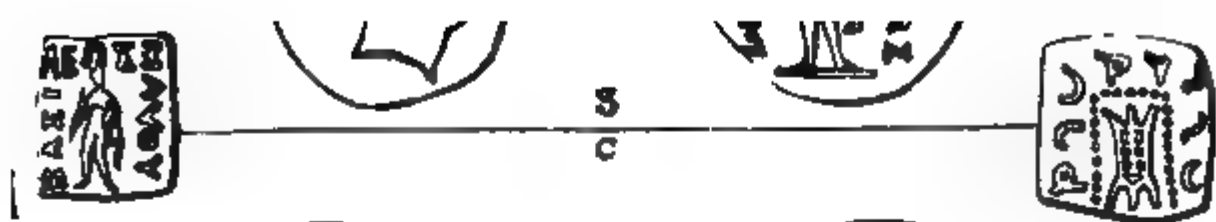
*Calliope.* A round silver Drachma. Two specimens, one in the possession of Lieut. Hasell ; the other in my own cabinet.

*Obv.* Two heads of the King and Queen to the right. Grecian legend, ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΕΡΜΑΙΟΥ ΚΑΙ ΚΑΛΛΙΟΠΗΣ “ (Coin) of the King, the Saviour Hermæus, and of Calliope.”

*Rev.* A horseman to the right as on the silver coins of Antimachus. In the field below a Grecian monogram forming ΝΙΦΑΝΔΑ Niphanda, the town where the coin was minted. Ariano-Pali legend, *Maharajasa tādātasa Hermayasa Kaliyapaya*. “ (Coin) of the great King, the Saviour Hermæus (and) of Kaliyapa.”

This is the third Græco-Bactrian Queen, with whom the coins have made us acquainted. The only point particularly deserving notice, is the feminine termination of the Pali Kaliyapaya ; which proves that the Pali was subject to the same inflections as the Sanskrit.

I would have added descriptions of a Tetradrachm and of two Drachmas of Diodotus ; but a notice of a gold Didrachma of this Prince has already appeared in the *Numismatic Journal of London* I intended also to have mentioned the numerous new types of princes already known, which have been sent to me by several kind friends ; but as I am engag-







ed upon a large work on the "Coins of Alexander's Successors in the East," I think it needless now to say more than that the new types, which will appear in that work, are more than equal in that number to those already known.

A. CUNNINGHAM.

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*On the Gem and Coins, figured as Nos. 7 and 8 in the preceding Plate, and on a Gem belonging to the late EDWARD CONOLLY. By the EDITOR.*

I have already, on more than one occasion, been enabled to place in juxta position, (though but with a casual remark,) relics of antique art found in Central Asia, and similar remains discovered in Europe; the former bearing too remarkable an affinity to the latter to allow of our doubting, that they were the work of a people who had attained the same standard of excellence in arts and sciences, who thought alike on matters of religion, and who were ruled and influenced by similar superstitions. I have been much impressed with this fact by other casual discoveries of a like nature, which have in a manner forced themselves on me, but which, as isolated, and perhaps to many, trivial instances of resemblance, hardly merited a separate and individual notice. There is, however, I am certain, a new and most interesting field of investigation open to the Antiquary, in the comparison of such identities and resemblances. Time, opportunity of research, and a sound knowledge of Asian antiquities are required for the conduct of such enquiry; and one who possesses none of these indispensable requisites, can do no more, when he stumbles on some startling fact, than cast the glimmer of his single discovery upon the darkness of an untried subject, in order to tempt the capable to venture on the novel path which he himself cannot follow. It remains to be seen, whether the instances which I will now lay before my readers, may not encourage the competent investigator to turn his mind to the task, with strong hopes of success in the effectuation of singular discoveries.

My friend Lieut. Cunningham has, with his usual care and ingenuity, taken occasion to illustrate by a gem in the possession of Mr. Tregear, the singular obverse of the coin of Telephus Euergetes, No. 8 of the preceding plate. The singular impression of this gem, used as the

seal of a letter addressed to me by Mr. Tregear, had already attracted my attention. I had written to him on the subject of its place of discovery, and I had ascertained by reference to sufficient authorities, that the "ancient giant with snaky legs," as Lieut. Cunningham so accurately describes it, was an emblem of Abraxas. The Ebermayer collection of gems, as illustrated by Bayer, has no less than eight similar, or nearly similar gems: six of these represent, *a giant with a whip in the left hand, a shield on the right arm, the head of a cock*, (the head in Tregear's gem, has the horns of a stag, as has one of the Eber. gems: it is apparently human in the coin of Telephus,) *and snaky legs*: the attitude is in all the same; the two other of these gems in the Ebermayer collection differ, by having the head of a lion, and of a hawk instead of a cock. My note book gives me the following abstract (from Tennison's Idolatry, which I have not at hand for reference) of the obscure and singular worship of this deity.\* "Abraxas was, according to the Basilideans, a visionary sect, which flourished in the second century, (taking their name from Basilides of Alexandria, their founder,) the sacred name of the author of the Cycle of 365 days, expressed in the value of the letters composing it according to the numeration of the Greeks.

$$\alpha \ 1. \ \beta \ 2. \ \rho \ 100. \ \alpha \ 1. \ \xi \ 60. \ \alpha \ 1. \ \varsigma \ 200 = 365.$$

It was the synonym of Abracadabra, a God worshipped by the Syrians, the same who is expressed by the emblem of a year (a circle) with the letters of his name triangularly disposed within it." It was essentially a Solar or Mithraic system of worship.

The learned and acute Bayer, in his illustration of the Ebermayer gems, observes of the Basilideans, that they and others who inclined to their doctrine, pretended to inscribe the planetary emblems, and their powers on gems and metals. "Basidiliani, alique eorum sectatores, confidunt se programmata siderum, et eorum vires gemmis et metallis insculpere posse." (Gemmarum Thesaurus, p. 210. cap. 432). This statement he supports by numerous authorities. Now if we have before us in Lieut. Cunningham's plate, both a *gem* and a *coin* inscribed, as I am prepared to shew they are, with emblems of the solar power and influence, (confirming Lieut. Cunningham's sound suggestion as to the

\* The original authorities regarding this sect are, Tertullian, "De Ræscriptionibus," Hieronymus, Augustin, and Irenæus.

character of the human figures on the reverse of the coin,) have we not discovered a singular clue to the religious opinions of those in whose time they were executed, and what is more valuable, have we not obtained collateral evidence as to the era of the recently known Telephus Energetes?

The erudite commentaries of Bayer, upon each of the gems above alluded to, run to too great a length, and touch upon too many details to render it necessary for my present enquiry that I should extract the whole of them. As my object is to shew the solar character of the emblem of Abraxas, and its identity with the figures on the coin and gem before us, I will extract his description of, and his notes upon, the gem, No. 438 of the Ebermayer collection, (Gem. Thes. p. 215), in which the solar attributes are described almost as we find them in Mr. Tregear's gem.

"Monstrum capite galli, trunco corporis humano, pedibus in serpentes duos desinentibus qui se reflectunt, scutum habens una manu, signatum literis ΙΑΩ, altera flagellum, virtutem habere creditum est contra inimicos, gestantemque reddere victorem; ad venena valere et sanguinem stringere; uti apud Commillum Leonardem, legimus,

GALLUM ἱερὸν ἡλίου ὄρνιθα esse, et mentiore solis ortum, testatus Pausanias, lib. v., et Plutarchus, de Pythiæ oraculis.

SCUTUM et FLAGELLUM significat, Abraxam suos credulos defensurum esse, et scuto protecturum et adversantes flagello castigaturum; et ideo ille pectus thorace tectum.

Pedes Anguinos, Macarius refert ad ortum indicandum; quia nempe Mithras sicut et Ericthionius, vel in lapide, vel in terra, de solo aestu libidinis sunt generati. Gigantes etiam serpentipedes fingeantur a veteribus, at diis insultantium miserabilem insolentiam deriderent. Conf. Macrobius. lib. i. Saturn apud Chifletium in Abraxa Proteo, p. 38."

With the exception of the letters ΙΑΩ, we have in our gem the correspondent emblems with those occurring in the one above described, and I have extracted Bayer's annotations on these ordinary attributes, because given at length with the gem No. 439: our gem has, however, one extraordinary additional symbol, imperfectly given in the lithograph, but perfect in the impression of the gem now before me, taken from a letter of Mr. Tregear's; viz. the stag's horns on the head of the cock. Our gem is in fact a facsimile, so far as figure is concerned of No. 443,

in the Ebermayer cabinet, with the difference, that the head of Abraxas in ours is turned to the right instead of the left. Bayer, and other annotators, most justly see in this extraordinary symbol another solar allusion, as if the Basilideans laboured to crowd every possible Mithraic emblem into their type of Abraxas. "Ramos cervi appositos Chiffetius non male censet, ut solis symbola omnia in unum cogerent Basilidiani. Cervus enim vivacissimum in primis animal; obid soli, vitæ principia excitanti, sacrum." (Gem. Thes. p. 220.)

IAΩ were with the Basilideans the letters expressing the Supreme Being,\* resident in the highest heaven. The indistinct head in the coin leaves us in doubt, as to the exact character of this part of the figure; it is enough to know that the hawk, the cock, and the lion are equally employed as Mithraic emblems in the compound form of Abraxas, the lord of the Solar Cycle, as shewn in instances already noted, and that it is immaterial as to the general meaning of the figure, which of these be employed to complete the mystical shape. Now this alternative use of common symbols being ascertained, and the figures on the reverse of the coin having a directly Mithraic character, I should be inclined to consider the form on the obverse as not the less Basilidean, because of the (apparently) human head which surmounts it. Bayer applies the term "Abraxea Mithriaca," to one of the Abraxead gems, (No. 438), which he describes, and such I conceive to be the symbolic effigy on the coin. The "*snaky legs*" are the constant attribute of Abraxas; the human head would not be inappropriate to the lord of the Cycle of 365 years in his directly Solar, or Mithraic character. The *shield* and *scourge* are not less emblematical of the solar† disk, (the "*clypeus solis*" of Ovid) and of Apollo *Auriga*, than of the minatory and protective power of Abraxas, a Mithraic form of the Deity; while the *serpent* is as observed in the above extract, directly referable to the generative power of the great luminary. Nothing is more natural than that the latter Grecian potentates of Western Asia, surrounded by the professors of a Mithraic belief, should have in part admitted the

\* "Deum Mosis appellatum IAΩ unde vox Jovis." Diodorus Siculus, Bibl. Hist. lib. i.

† "Corpus Solare seu discus solis in Libro *Phark Gj.* vocatur سپهرسپاس i. e. *Pelta Nigra*, seu *Clypeus niger*; idque propter rotundam formam." (Hyde's Hist. Religionis Veterum Persarum, cap. iv.) This invests still more closely Abraxas with a Mithraic character.



Basilidean doctrines, or a modification of them; and one is perhaps the less surprised to find Telephus, *the beneficent*, acknowledging in the generative and preservative influence of the sun, a principle of good, which his name would lead us to conclude, he in particular professed the practice of.\* That a general tendency to acknowledge the Mi-

\* I do not like to leave this subject without a few words regarding the Inscriptions on the Basilidean gems in the Ebermayer collection. Mr. Tregear's Basilidean seal is destitute of letters, but others may be discovered bearing characters, and to facilitate investigation, I will, as Bayer's Thesaurus is excessively rare, copy in this place the different words found on the gems figured in his book. I should premise, that all the words are written "*literis inversis*," or from right to left, which will prove a key to future discovery, should we be fortunate enough to recover further specimen of these interesting relics.

Ebermayer Gems, No. 437. Abraxas; on the reverse, : ΑΗΟΥΒΑΧ  
: ΛΗΙΑΡΟΟΡΠ : ΛΗΑΝΑΝΑ : ΛΗΑΡΑΡ : ΛΗΙΡΥΟ  
: ΛΗΑΡΒΑΛ : ΛΗΑΧΙΜ.

These names are placed in the gem one above the other, beginning from the right, being the names of the seven angels, *Michael, Gabriel, Uriel, Raphael, Ananiel, Proseriel, and Chabsael*, of whom, or of their synonyms in the etherial world, "the masters of the seven stars." Bayer gives in the following abstract the Basilidean creed:—

"In nominibus quidem angelorum, quos Trithepines intelligentio vocat in *tractatu de Septem Secundeis*, non conveniunt annotante discrimen laudatissimo Jul. RICHULT, N. 39. p. 48-49: quod mirum nemini videbitur; siquidem nec Saturnilo cum Basileide condiscipulo conveniebat, qui apud Epiphanium hæresi 23, angelos, agebat, a superiori virtute descibisses ex quibus septem mundum, et quæ in mundo, sunt comprehensa, condiderunt, ejusque mundi suam quemque angelum partem divisione sortitum, *Cassiel* orbem Saturni; *Sachreel*, Jovis; *Samuel*, Martis; *Michael*, Solis; *Ananeel*, Veneris; *Raphael*, Mercurii; *Lunæ*, itidem, *Michael*." (p. 219.)

Eber. Gems, No. 438. Abraxas, the scourge, and shield in the right hand, his left on the head of a man, kneeling, and naked; below him the sacred name written ΘΑΙ; behind the kneeling figure ΕΔΔΖΑΒΑΙ, of which Bayer makes CABAΩΘΘΕΟΣ: on the reverse a lion, (Mithraic emblem of the sun,) a crescent, and seven stars.

Eber. Gem. No. 439. Abraxas: on his shield Α Ι: on the reverse.

Ω

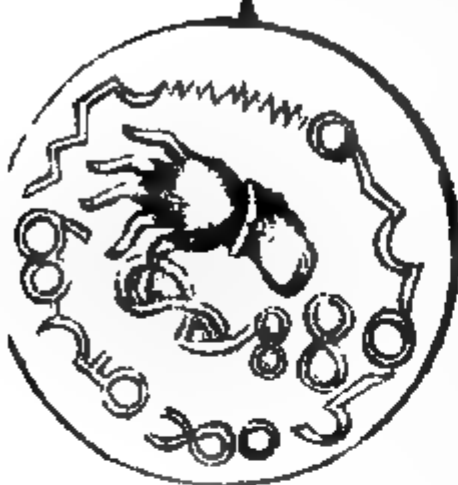
ΙΑΒΝ: ΟΧΟΤΝ: ΟΡΟΑΡΑΩ: ΦΙΑΡΑ: ΑΛΑΤ.

These words are placed one above the other beginning from the right, the dots between them merely mark the termination of a line. Bayer calls them *Ægyptian*, and translates, "*summo marti omnia vincenti*."

Eber. Gems, No. 440. Abraxas: about him the letters ΝΟ≡ΦΟ on the reverse ΑΖΑΖ, an abridged form perhaps of Abraxas.

Eber. Gems, No. 441. Abraxas: above him, (but inversed,) the words ΙΟΥΙΟΥ  
ΩΙΟΥΝΥ ΥΟΥΥΩ ΩΝΙΟΥ, which Bayer translates "*Domini fortitudo eterna*," below him ΙΑΩΑΗΛ (inversed) translated "*Angelus Domini*."

thraic Abraxas did prevail among the contemporaries of Telephus is sufficiently shown by the occurrence on a coin of Hippostratus, as noted by Lieut. Cunningham, of a figure having the most striking of the Abraxead attributes; I am the more inclined therefore to believe that the present discovery will to further illustration of the presence of a Basilidean worship, the types of which have hitherto been inexplicable on the coins which present them.



2



Another, and a very curious instance of analogy between the usage and superstitions of the ancient inhabitants of Khorassan and the classic nations of Europe, is exhibited in the annexed plate. The figure No. 1, is a magnified drawing of the gem, (No. 2,) placed below it. It is one of a set of impressions sent to me by the late Edward Conolly, who was killed in action in the Kohistan near Kabul. The drawing is faithfully copied from his own, which is accompanied by these remarks:—

“As the original of this is very small, a drawing on a larger scale is forwarded of the Inscription. We cannot tell whether it be Syriac, or what; the letters seem to be — (illegible) and to bear no resemblance to Pehlevi. The unavoidable scantiness of our marching libraries must serve,” he observes further on, “as excuse for these meagre, and unimportant notes.”

I was discouraged from publishing a plate of the impressions of the gems which accompanied the above, from an idea that these would prove of little interest, from the impossibility in most instances of drawing more than conjectural inferences from their subjects. Looking

Eber. Gems, No. 442. Abraxas: a figure of Mars upon his head;  $\text{IAQ}$  below him; on the reverse  $\text{IAQ ABPAXAS}$ , inverted.

Eber. Gem, No. 443. Abraxas: with the addition of stag's horns, of which Bayer gives a solar allusion to seven stars below him:  $\text{IAQ}$  on the shield; the words (inverted)  $\text{PAIN XIOIOIOX}$  about him. (?)

Eber. Gem, No. 444. Abraxas: lion-headed with a sword in place of the scourge: on the reverse the word  $\text{TITANTOPHKTA}$ , (inverted) translated, “*fortitudinis martiae, et gigantis.*”

Other Basilidean emblems occur on gems in this collection, but none but those of Abraxas. Should gems be found of a similar character in Central Asia, these hints may lead to their identification.

at them, however, as I often did, in the hope of chancing upon some plausible theory regarding them, I remembered to have observed in a small illustrated edition of Virgil, (Knapton, and Sandby, London, 1750, 2 vols. duod.), which is I believe rare, the representation of a gem, having a subject almost similar to that of Conolly's, *a hand holding an ear*. On referring to the book, I found the gem I was in search of, Pl. VII. Vol. I., the original being in the Florentine Museum.\* The only very marked difference observable between the gems is that the Oriental artist has added to the lobe of the ear, what is apparently intended for a massive ornament; the relative position of the hands in the two gems varies slightly, but there can be no doubt that the sentiment is identical. The meaning of the sign cannot be better given than by extracting Faber's Notes upon it, (Fabri Thesaurus, in voc. *Auris*.)

Aurem vellere: **erinnern ermahnen warnen** G. *avertir reprimander*. Virg. ecl 6.3.

“ ————— Cynthius aurem

Vellit & admonuit ;”

Sen, 4 de Benef. 36. “Aurem nuihi pervellem,” **Ich will mirs hinter das Ohr schreiben** G. Je m'en souviendrai en tems et lieux. Tractum ab attestantibus qui attestanti imam auriculam tangebant, cum hoc verbo, “Memento.” Propterea quod auris memoria sacra sit, ut ad Virg. l. c. Servius annotat. Plin. 11. 45 “Est in aure ima memorie locus quem tangentes attestantur.” Ac vidisse se Muretus 1 Var. Sect. 12. 5, testatur veteres nummos æreos, in quibus viri duo insculpti erant, quorum unus alteri aurem vellebat; in orbem autem scriptum erat. **MNHMONEYE**.—“ (Fab. Thes. vol. i. p. 281.)”

It is indeed a curious fact to find a symbol, which Virgil alludes to and Pliny explains, represented on a gem found in Khorassan, and that with a degree of graphic fidelity not unequal to what is displayed in one of the precious relics of the Florentine Museum, yet illustrated by the illegible characters of an unknown language! The most interesting point is of course the occurrence of these characters in conjunction with a sign to which the word they form must have distinct explanatory reference, and but one of two inferences can be drawn; either that the word **MNHMONEYE** occurs written in these characters on the gem, or

\* The note in the work I cite from is, “*Gemma ex Museo Florent. Tom. 2. Tab. 22. in qua manus aurem imam vellens, Spect. ecl. 6. v. 3.*”

that a corresponding admonition to connect this symbol with the memory of a duty, or of an obligation, is conveyed by them in the language, whatever it was, of which they were the vehicle. My readers will observe, that I have not given these letters in the plate of the gem in its natural size, and I much regret my inability to do so; it is owing partly to the lithographer's having failed to copy them with exactness, and partly to the annoying fact, that none of the four impressions which I have of the gem, contains the whole inscription in perfection. The gem, like many of those found in Khorassan and Afghanistan, is cut on a convex surface, which enhances the difficulty of distinguishing any marginal impressions, and the wax on which poor Conolly has taken it off, is invariably of the worst description. Thus it is only by taking the characters piecemeal from the several impressions, that I can verify the reading given on the enlarged drawing of the original. The letters are not dissimilar to those found on other gems from Afghanistan, impressions of which are in my possession, and the most remarkable of which are of a decidedly Mithraic character.

It is idle almost to hazard conjecture, as to the language which was expressed in these letters. A sort of affinity may be perhaps discovered between the Syriac character and this, but in the present stage of our ignorance, nothing can be advanced on the subject beyond the vaguest conjecture. We have established, however, that the language, whatever it was, either allowed of the adoption of Greek words into it, which were expressed in its peculiar character; or that, adopting Greek habits and superstitions, those who spoke this language translated into their own tongue the apothegms or admonitory expressions, which accompanied particular symbols in vogue among a Grecian, or *Grecised* people. Should circumstances admit of further research, this clue to possible discovery will be valuable. In the mean time, not even the most ingenious and acute could, I fear, derive definite conclusions from the meagre facts before us. We have, however, seen a Champollion unravel the mysteries of Ægyptian hieroglyphies; a Prinsep decypher by a comparative process of, at first, apparently hopeless difficulty, the unknown characters of more than one unspoken language; a Rawlinson verify the accounts of the Father of History, by his reading of the cuneiform records of Persepolis: hence therefore I confidently believe that, should further material for the comparison on a scale sufficiently extensive be discovered in this unknown character, the elucidation of



many historical difficulties by the ascertainment of the value of the letters, and the consequent determination of the language they expressed, is very possible, and is very much more than probable.

My own task is accomplished, if by the brief remarks above made, and by the curious analogies brought forward, I shall have succeeded in awakening the attention of competent enquirers to the subject. Few, it is true, have opportunities in this country of devoting time to the study of such subjects. Many though have the means of forming collections, which however indiscriminately made, will furnish the material and the means for enquiry. I sincerely trust, that no man able to appreciate the importance of such an investigation, and more particularly, that no member of the Asiatic Society, will fail to avail himself of every occasion to further it.



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*Observations on the Genus Spathium.* By M. P. EDGEWORTH, Esq.

Happening to meet with two species of *Aponogeton* (Roxb.) in this neighbourhood, I compared them with the generic character of *Spathium* in Endlicher's *Genera Plantarum*, to which they are referable. I observed that he describes the embryo as unknown, and therefore, especially directed my attention to that point. By Endlicher, the genus is referred to *Saurureæ*, I am therefore not a little surprised on examining the *S. undulatum*, to find it distinctly monocotyledonous, with a large fleshy cotyledon embracing a plumule of unusual size and development. On examining the seed of *S. monastachys*, however, I found a very different structure, a homogeneous mass, in which I could find no trace of an embryo; but on causing the seeds to germinate,\* which they do freely in water kept in a cup, I discovered that this homogeneous mass is in reality the cotyledon and the plumule, which after an interval of some days develops itself through a slit at the base of the horn-shaped cotyledon.

The *Sp. undulatum* likewise germinated readily. The only other point to be noticed now, is, whether these two plants are referable to one and the same genus, while so marked a difference exists in the embryo. The one with the plumule of unusual size, (equalled only by the development of that part in *Nelumbium*,) and the foliaceous cotyledon—the other with its plumule invisible even at the commencement

\* I owe this experiment to Dr. Falconer's kindness.

of germination, and its solid cotyledon—while there are the minor differences of the relvaceous foliage and caducous bracts of the former, as contrasted with the herbaceous foliage and persistent bracts of the latter. There is, moreover, a slight difference in the pollen of the two plants, that of the former being exactly and acutely elliptic, and assuming a globular form under the influence of acid or iodine; that of the latter gibbously ovoid, and not influenced in the same manner by the iodine solution or acid.

From the description of *Aponogeton pusillum* in Roxburgh's F. I. and the section of the fruit of *A. echinetum*, in his Cor. Plants, t. 81, I should judge that they would have the same characteristics as the *A. undulatum*. They may perhaps be found to be intermediate, in which case the two species I have examined may be fairly considered as the extremes of a single genus. From the general habit, and the position of the bracts of *Endlicher* resembling that of half a floral envelope, for which reason I term them sepals in the description, the place of this genus would appear to be next to *Potamogeton* among the *Naides*.

I have subjoined an amended generic character, and fuller descriptions of the two species I have examined.

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*Spathium Loureiro. Endlich. Gen. 1826, p. 267.*

Floris hermaphroditi, in spadice cylindraceo pedunculato spathâ monophyllâ caducâ cincto spiraliter dispositi sessiles. Sepala duo petaloidea sub-opposita. Stamina sex, hypogynæ; filamenta libera subulata patentia persistentia, antheræ bilocularis lateraliter dehiscentes.

Ovaria tria (vel. 4 ?) rostris erectis, stigmate apicale, minutum obliquum; ovula basi affixa 2-6, ascendentiæ. Folliculæ 3 (4 ?) introrsum dehiscentes, 1-3 spermæ, semina erecta ovata; testâ duplici, exteriori herbacea, interiori membranacea, vel evanidâ. Embryo exalbuminosus macropodus, erectus, ascendens, anatropus cotyledine magno, vario, plumulâ variâ.

Sp. monostachys. Foliis petiolatis lineari, oblongis basi subcordatis emersis herbaceis. Floribus in spadice dense confertis sepalis persistentibus.

Rhizoma tuberosum radicibus crassis filamentosis ad apium rhizomatis. Folia petiolata, petiolis subtrigonis basi membranaceis interiora amplexantibus, folia lineari, obliquis obtusis, basi subcordatis, vel junioribus cuneatis, 5 nerviis, venis transversalibus.

Spadice pedunculato, pedunculo cylindrico, involucro herbaceo caducissimo; Floris densè spiraliter dispositi sepalis, junioribus sub-imbricatis, coruliis basi oblique cuneati apice subcordato ovatis. Stam. 6, filamentis crassis bractæis sub-longioribus antheræ cerulæ sub-quadrata biloculari, lateraliter dehiscentes, polline gibbi ellipsoideoo lutieo. Ovaria erecta-lævia 3-6 spermis, semina 2-4 (2-3 abortientibus,) erectis ovatis, 8 costatis. Testa exterior herbacea viridi laxâ facile separabili. Interior ad embryonem arete adpressa brunnea leviter striata, uno latera raphe irridi, chalaza magna viridi.\* Cotyledon germinans elongatur in cornu, plumata diutius basi lateraliter fissio evolvitur, folio elliptico, cotyledon solidum, album, plumule basilare minimum.

Sp. undulatum. Foliis brevi petiolatis lineari oblongis, basi cuneatis, submersis ulvaceis. Floribus in spadice post anthesin elongato sejunctis. Sepalis caducissimis.

Rhizoma tuberosa, radicibus crassis paucis filamentosis ad apicem.

Foliis plurimis radicalibus petiolatis, lanceolatis, undulatis a limbo in petiolium decurrente nervo medio crasso, lateralibus, 2-4 paralleles nervis transversalibus. Limbo plerumque petiolo longiore vernatione involuti.

Floriis numerosi in spadice elongato dispositi; primo confertis, rachides elongatâ sparsis pedunculo longissimo emersi. Spatha acuta ante anthesin decidua. Sepalis 2, sub-spathulatis basi quasi unguiculatis coloratis (lacteo-albis) caducissimis, ad stamina 2 lateralia oppositis.

Stamine 6. filamentis erectis divaricatis carnosis persistentibus. Anthera biloba lateraliter dehiscente decidua e flavo cœrulescente. Polline luteo acute elliptico (in iodino vel acido globosa.)

Pistille 3, ovario superiore libero, stigmat terminal. Fructus 2, carpillis 3 follicularibus basi subinerveis demum divaricatis sistuis.

Follicula disperma, seminibus erectis umbilico brun. Testa lævi, simplex; vel membrum exterior tenuissima vix discreta. Raphe et chalazâ non cernabilibus.

Embryo erectus macropodus. Cotyledone maximo concavo carnosio plumulam amputente. Plumula (in semine etiam) maxima bifolia, foliis inæqualibus margine involutis.

\* Roxburgh describes the rachis as wood. I have not seen this appearance in any specimen I have met with.

Note.—Roxburgh describes the flowers as in monastachy, but there is considerable difference between my two species, perhaps this may not be his Undulatum, but otherwise it fully answers his description.

*References to the Plates of Spathium Monostachys.*

- a.* A single flower, seen sideways.
- b.* Ditto from below or front, shewing the two bracts in situ.
- c.* Stamen.
- d.* A bract.
- e.* Imaginary section, shewing situation of parts of flower.
- f.* Flower after inflorescence and capsules nearly ripe, with  
tent bracts and stamens.
- g* and *g.* Another more magnified, and resting on the side.
- h.* Section of ditto, shewing its two cells placed back to back
- i* and *i.* I. Pollen, gibbous at one side, much magnified—in *H*  
*j.* globose under the influence of iodine.
- k.* Pistil, with small oblique terminal stigma.
- l.* Ditto, section shewing ovaries in situ.
- m. m.* Capsules.
- n.* Section of ditto.
- o.* Seed.
- p.* Ditto magnified, shewing the ribs of the outer-coat.
- q.* Ditto, outer-coat taken off, shewing the raphé and *cl*  
various veins.
- r.* Embryo, all the coats taken off.
- s.* Second coat taken off, striated, dark brown, chalaza *gro*  
verse.
- t.* Section of seed, shewing the eight ribs of outer-coat.
- u.* Embryo section.
- v.* Seed, longitudinal section.
- w.* Germinating seed.
- x.* Longitudinal section of ditto.
- a.* Ditto further advanced.
- y.* I. Plumula, extracted from *a*—II. Plumula in seed before  
nation.
- z.* *y.* More magnified.
- $\beta$  *t* *s.* Progressive states of germinating seed.
- $\zeta$  Part of leaf magnified.











Day.	Morning Tide A. M.						Evening Tide P. M.						Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.			
	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	
1 "	9 30	9 0	4 4	4 0	13 4	4 4	9 50	9 3	4 26	13 4	4 1	N. ....	6 A. M. drizzling rain, 12 P. M. clear throughout, 5 P. M. cloudy, 6 P. M. thunder.
2 "	10 0	9 6	3 2	4 45	12 8	3 2	10 30	9 10	5 0	12 6	2 8	N. ....	12 P. M. clear throughout, 4 P. M. cloudy.
3 "	11 0	10 0	2 3	6 0	12 3	2 3	11 35	10 1	6 30	12 6	1 11	S. ....	9 A. M. cloudy, 12 P. M. clear, 3 P. M. cloudy.
4 Sunday,	12 0	9 11	1 0	7 0	10 11	1 0	1 0	9 9	7 45	12 2	2 5	N. ....	7 Ditto drizzling rain, 12 P. M. clear.
5 "	2 0	9 8	2 9	8 0	12 5	2 9	3 0	9 6	8 35	12 8	3 2	N. N. W.	9 Do. do. do., with little sunshine, 12 P. M. clear.
6 "	3 30	9 4	3 8	8 50	13 0	3 8	3 50	9 2	9 0	13 3	4 1	N. ....	12 P. M. Clear, 4 P. M. cloudy.
7 "	4 0	9 0	4 5	9 30	13 5	4 5	4 30	8 10	9 50	13 9	4 11	S. ....	6 A. M. Showers, 12 P. M. clear throughout, 5 P. M. cloudy.
8 "	4 55	8 9	5 3	10 0	14 0	5 3	5 15	8 6	10 30	14 3	5 9	N. ....	6 A. M. light rain, 12 do. do. do., 4 P. M.
9 "	5 30	8 5	6 1	10 50	14 6	6 1	5 50	8 2	11 5	14 9	6 7	S. ....	12 P. M. Cloudy, 3 P. M. ditto ditto.
10 "	6 5	8 0	7 0	11 25	15 0	7 0	6 35	7 9	11 50	15 4	7 7	N. ....	6 A. M. Clear throughout, 12 P. M. cloudy.
11 Sunday,	6 50	7 6	8 1	12 0	15 7	8 1	7 5	7 4	12 30	16 0	8 8	W. ....	7 Do. drizzling rain with sunshine, 12 P. M. clear throughout, 3 P. M. cloudy, 5 P. M. showers.
12 "	7 35	7 1	9 6	12 50	16 7	9 6	8 0	6 10	1 5	17 0	10 2	N. ....	8 Ditto sultry, 12 P. M. clear.
13 "	8 20	6 9	10 3	1 35	17 0	10 3	8 50	6 9	1 50	17 0	10 3	N. N. W.	6 Do. drizzling rain, 12 P. M. clear throughout, 3 P. M. cloudy.
14 "	9 0	6 11	9 1	2 30	16 0	9 1	9 30	7 3	2 50	15 6	8 3	N. ....	12 P. M. ....
15 "	9 50	7 7	7 5	4 5	15 0	7 5	10 5	7 10	4 35	14 8	6 10	S. ....	7 A. M. ....
16 "	11 0	8 2	6 2	5 15	14 4	6 2	11 45	8 5	5 0	14 0	5 7	N. N. W.	12 P. M. ....
17 "	12 0	8 10	4 8	6 30	13 6	4 8	12 50	9 4	6 50	13 0	3 8	N. N. W.	7 A. M. ....
18 Sunday,	1 0	9 2	3 6	7 35	12 8	3 6	1 35	9 6	7 50	12 6	3 0	N. N. E.	12 P. M. Ditto, 4 ditto ditto.

*Register of the Rise and Fall of the Tide at Prince of Wales Island  
of the Government of India.—October 11*

*to the Editor by order*

Day.	Morning Tide A. M.					Evening Tide P. M.					Wind.	Weather, &c.	
	Low Water.		High Water.		Range of Tide.	Low Water.		High Water.		Range of Tide.			
	Time.	Height.	Time.	Height.		Time.	Height.	Time.	Height.				
19	1 45	10 0	8 5	12 2	2 2	N. ....	2 0	10 0	8 35	12 0	2 0	N. N. E.	10 A. M. Cloudy, 12 ditto drizzling rain, 4 P. M. clear.
20	2 30	9 9	8 50	12 4	2 7	N. N. E.	2 50	9 6	9 5	12 7	3 1	N. N. E.	10 Ditto ditto throughout, 1 P. M. showers 3 ditto ditto throughout.
21	3 0	9 3	9 35	12 9	3 6	N. E.	3 30	9 0	9 50	13 1	4 1	N. ....	6 Do. ditto, 8 A. M. showers, 1 P. M. drizzling rain.
22	3 55	8 9	10 35	13 4	4 7	N. E.	4 5	8 6	10 35	13 7	5 1	N. N. W.	6 Ditto ditto and drizzling rain, 12 ditto clear with strong breezes from N. E.
23	4 35	8 3	10 50	13 9	5 6	N. ....	4 50	8 0	11 5	14 2	6 2	N. N. E.	11 Do. drizzling rain with sunshine, 12 P. M. cloudy, 3 P. M. thunder, 5 P. M. showers.
24	5 0	7 9	11 20	14 5	6 8	S. ....	5 30	7 6	11 50	14 7	7 1	N. N. E.	7 Ditto clear throughout, 3 P. M. cloudy, 5 ditto rain and thunder.
25 Sunday,	5 50	7 3	12 0	14 10	7 7	N. N. E.	6 0	7 1	12 30	15 1	8 0	N. N. E.	6 Ditto do. do., 2 do. do., 4 do. thunder.
26	6 30	6 10	12 50	15 3	8 5	N. N. E.	6 50	6 8	1 0	15 3	8 7	N.	6 Ditto ditto ditto, 4 ditto ditto, 6 ditto do.
27	7 0	6 11	1 30	15 0	8 1	N. N. E.	7 30	7 2	1 50	14 9	7 7	N. N. E.	7 Do. cloudy, 12 P. M. clear, 2 P. M. cloudy.
28	7 50	7 6	2 0	14 6	7 0	N. N. E.	8 0	7 9	2 30	14 1	6 4	N. ....	6 Ditto clear, 10 A. M. cloudy, 12 ditto light rain, 2 P. M. clear, 4 P. M. cloudy.
29	8 30	8 2	2 45	13 8	5 6	S. ....	8 45	8 5	3 0	13 5	5 0	N. N. E.	7 Ditto ditto, 10 ditto do., 12 do. thunder, 5 ditto cloudy.
30	9 0	8 7	3 15	13 3	4 8	S. ....	9 15	8 10	3 35	13 0	4 2	N. N. E.	6 Ditto do., 12 P. M. ditto, 1 ditto do., 3 do. clear, 5 P. M. cloudy, 6 P. M. drizzling rain.
31	9 35	9 0	3 45	12 9	3 9	S. ....	9 50	9 3	4 0	12 6	3 3	N. ....	7 Ditto cloudy, 8 A. M. showers and strong breezes from E., 12 ditto clear throughout. (Signed) W. DAWSON. Master.

W. DAWSON,  
Harbour Master.

Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India—November 1840.

Day.	Morning Tide A. M.						Evening Tide P. M.						Weather, &c.	
	Low Water.			High Water.			Low Water.			High Water.				Wind.
	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.					
1 Sunday.	10 0	9 6	4 40	12 4	2 10	N.	11 35	9 8	6 15	12 1	2 5	N.N. E.	6 A. M. clear, 2 P. M. cloudy, 3 P. M. thunder, 4 P. M. drizzling rain.	
2 "	12 0	9 11	6 40	11 11	2 0	N.	12 50	10 2	7 30	11 8	1 6	N. E. . .	12 P. M. Ditto throughout, 3 P. M. cloudy, 4 P. M. drizzling rain.	
3 "	1 0	10 0	8 0	12 0	2 0	N.N.W.	2 0	9 10	9 0	12 4	2 6	N.N. E.	7 A. M. Ditto do., 1 A. M. do., 3 do. do. do.	
4 "	3 0	9 8	9 50	12 7	2 11	N. ....	3 30	9 6	10 0	12 9	3 3	N.N. E.	6 Ditto ditto do., 5 P. M. ditto.	
5 "	3 50	9 3	10 20	13 1	3 10	N.N.W.	4 0	9 0	10 50	13 6	4 6	N.N. E.	12 P. M. Ditto do., 2 do. do., 3 P. M. thunder.	
6 "	4 30	8 10	11 5	13 9	4 11	N.N.W.	5 0	8 6	12 30	13 11	5 5	E.	6 A. M. Ditto do., 1 ditto do., 4 ditto ditto.	
7 "	6 0	8 3	12 50	14 2	5 11	N. ....	6 30	8 0	1 0	14 5	6 5	E.	7 Ditto do. do., 2 ditto do., 3 do. do., 5 P. M. drizzling rain.	
8 Sunday.	6 50	7 10	1 30	14 8	6 10	N. ....	7 10	7 7	1 50	14 11	7 4	E.	8 Ditto do. do., 12 do. do., 3 do. ditto, 4 do. ditto ditto.	
9 "	7 40	7 3	2 0	15 2	7 11	N. ....	8 0	7 0	2 0	15 5	8 5	E.	7 Ditto do. do., 1 do. do. 3 do. drizzling rain with sunshine.	
10 "	8 30	6 9	2 30	15 8	8 11	S. ....	8 50	6 6	2 50	15 10	9 4	N.N. E.	6 Ditto do. do., 2 do. do., 4 do. thunder, 6 do. drizzling rain.	
11 "	9 0	6 7	3 0	15 11	9 4	S. ....	9 30	6 10	3 30	15 3	8 5	N.N. E.	6 Ditto do. do., 1 ditto ditto.	
12 "	9 50	7 1	3 50	15 0	7 11	S. ....	10 0	7 4	4 0	14 9	7 5	E.	6 Ditto do. do., 10 A. M. ditto, 5 P. M. cloudy throughout.	
13 "	10 30	7 8	4 30	14 6	6 10	N.N.W.	10 50	7 11	4 50	14 3	6 4	E.	8 Ditto ditto ditto, 4 P. M. do., 5 do. clear.	
14 "	11 0	8 4	5 0	14 0	5 8	N.W.	11 30	8 7	5 30	13 6	4 11	E.	7 Ditto ditto do., 4 do. do., 5 do. thunder.	
15 Sunday.	11 50	8 9	5 50	13 0	4 3	S. ....	12 15	9 0	6 10	12 10	3 10	N. E. . .	12 P. M. Ditto ditto, 1 ditto do., 6 ditto ditto.	
16 "	12 45	9 3	6 35	12 10	3 7	S. ....	1 0	9 5	6 55	12 9	3 4	N. E. . .	8 A. M. Ditto ditto, 2 ditto ditto, 5 ditto ditto.	

and Singapore, furnished to the Editor by order  
1840.—(Continued.)

Register of the Rise and Fall of the Tide at Prima  
of the Government of

Day.	Morning Tide A. M.						Wind.	Evening Tide P. M.						Range of Tide.	Wind.	Weather, &c.
	Low Water.			High Water.				Low Water.			High Water.					
	Time.	Height.	Time.	Height.	Time.	Height.		Time.	Height.	Time.	Height.					
17	1 30	9 8	7 5	12 7	2 11	N. ....	1 50	9 11	7 35	12 6	2 7	N.N.E.	7 A. M. Clear throughout, 3 P. M. cloudy and drizzling rain.			
18	2 5	10 2	7 55	12 7	2 5	N.N.W.	2 35	9 11	8 5	12 9	2 10	N.N.E.	7 Ditto do. do., 2 do. do. 5 P. M. thunder.			
19	2 50	9 9	8 35	13 0	3 3	N.N.W.	3 5	9 7	8 55	13 3	3 8	N.N.W.	6 Ditto do. do., 1 do. do., 4 do. clear throughout.			
20	3 35	9 5	9 10	13 5	4 0	N. ....	3 50	9 3	9 45	13 7	4 4	E. ....	[P. M. cloudy.			
21	4 5	9 3	10 0	13 9	4 6	N. ....	4 35	8 9	10 30	14 0	5 3	S. ....	clear throughout, 4 P. M. do., 5 P. M. [P. M. clear.			
22 Sunday,	4 50	8 7	10 50	14 2	5 7	N.N.W.	5 0	8 6	11 0	14 5	5 11	E. ....	2 P. M. cloudy, 4 do., and equally			
23	5 30	8 2	11 20	14 7	6 5	N. E. ....	5 50	8 0	11 45	14 9	6 9	N. ....	from N. N. W.			
24	6 0	7 9	12 0	14 11	7 2	E. ....	6 30	7 10	12 25	14 7	6 9	N.N.W.	12 P. M. Ditto ditto, 2 ditto do., 5 P. M. thunder.			
25	6 50	7 11	12 45	14 5	6 6	N.N.W.	7 0	8 1	1 0	14 2	6 1	E. ....	6 A. M. Ditto do., 12 do. do., 2 do. cloudy throughout, 5 P. M. strong breezes from N. N. W.			
26	7 30	8 2	1 20	13 10	5 7	E. ....	7 50	8 5	1 50	13 7	5 2	N. E. ....	drizzling rain, P. M. cloudy, 3 do. thunder, 5			
27	8 0	8 7	2 0	13 5	4 10	N. E. ....	8 30	8 9	2 25	13 3	4 6	N. ....	8 Ditto ditto do., 4 do. do., and thunder.			
28	8 50	8 8	2 45	13 2	4 6	N. ....	9 0	8 10	3 0	13 2	4 4	S. ....	6 Ditto cloudy, 12 P. M. clear throughout.			
29 Sunday,	9 25	9 0	3 20	13 1	4 1	S. ....	9 45	9 1	3 50	13 3	3 11	N. ....	G. DAWSON, Harbour Master.			
30	10 0	9 2	4 0	13 0	3 10	M. ....	1 20	9 5	4 20	13 0	3 7	N.N.W.	(Signed)			

Day.	Morning Tide 4. M.						Evening Tide P. M.						Wind.	Range of Tide.	Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.					
	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.	Time.	Height.	Range of Tide.			
1	10 50	9 8	4 50	12 10	3 2	N.N.W.	11 0	9 11	5 0	12 8	2 9	N. ....	6 A. M. drizzling rain, 12 P. M. clear throughout, 3 P. M. cloudy.		
2	11 30	10 1	5 30	12 6	2 5	N. ....	11 50	10 3	5 50	12 4	2 1	N.N.W.	6 Ditto ditto ditto 12 ditto ditto ditto 4 ditto ditto.		
3	12 0	10 5	6 0	12 4	1 11	N. ....	12 30	10 1	6 30	12 6	2 5	N.E. ....	12 P. M. Clear throughout, 5 ditto cloudy.		
4	12 50	9 11	6 50	12 8	2 9	N. ....	1 0	9 8	7 0	12 9	3 1	N.E. ....	12 Ditto ditto ditto 3 ditto do. and strong breezes from N.		
5	1 20	9 6	7 20	12 11	3 5	N. ....	1 50	9 3	7 50	13 0	3 9	E. ....	6 A. M. Cloudy, 12 P. M. clear, 3 P. M. cloudy		
6 Sunday	2 0	8 11	8 0	13 3	4 4	N.N.W.	2 30	8 9	8 30	13 5	4 8	S. ....	3 P. M. drizzling rain.		
7	2 50	8 7	8 50	13 6	4 11	N.N.W.	3 0	8 5	9 0	13 8	5 3	S. ....	7 Ditto ditto, 12 ditto ditto, 3 ditto ditto 5 ditto thunder.		
8	3 30	8 3	9 30	13 9	5 6	N.N.W.	3 50	8 0	9 50	13 11	5 11	N. ....	7 Do. d out, i 12 P. M 5 ditto cloudy.		
9	4 0	7 10	10 0	14 0	6 2	N.N.W.	4 20	7 8	10 30	14 1	6 5	N.N.W.	12 Ditto ditto ditto, 2 ditto ditto, 5 P. M. thunder.		
10	4 50	7 6	10 50	14 2	6 8	S. ....	5 0	7 4	11 0	14 4	7 0	N. ....	5 ditto do., 6 do. do. do.		
11	5 20	7 2	11 20	14 5	7 3	S. ....	5 50	7 0	11 50	14 5	7 5	E. ....	12 do, 4 ditto ditto, 6 ditto,		
12	6 0	7 1	12 0	14 5	7 4	N. ....	6 30	7 4	12 30	14 2	6 10	N.E. ....	12 Ditto ditto ditto, 2 do. do. 4. do. thunder.		
13 Sunday	6 50	7 7	12 50	13 10	6 3	N.N.W.	7 0	7 9	1 0	13 7	5 10	N.E. ....	6 A. M. Ditto ditto, 12 ditto ditto, 4 do. do.		
14	7 20	8 2	1 20	13 4	5 2	N.N.W.	7 50	8 5	1 50	13 1	4 8	N.E. ....	7 Ditto ditto ditto, 12 ditto ditto.		
15	8 0	8 6	2 0	12 11	4 5	S. ....	8 30	8 8	2 30	12 9	4 1	N. ....	6 Ditto ditto ditto, 12 do. do., 5 P. M. clear.		
16	8 50	8 11	3 0	12 8	3 9	S. ....	10 0	9 2	4 0	12 6	3 4	N. ....	6 Ditto ditto ditto, 12 ditto ditto.		
17	10 45	9 3	4 45	12 4	3 1	N. ....	11 0	9 6	5 0	12 4	2 10	S. ....	8 Ditto cloudy 12 P. M. clear throughout, 5 P. M. cloudy.		

*Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore furnished to the Editor by order of the Government of India,—December, 1840.—(Continued.)*

Day.	Morning Tide A. M.						Evening Tide P. M.						Wind.	Range of Tide.	Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.					
	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.					
18	"	11 45	9 6	5 45	12 6	3 0	N. ....	12 0	9 3	6 0	12 9	3 6	N.N.W.	6	6 A. M. drizzling rain, 12 P. M. clear, 4 P. M. cloudy.
19	"	12 35	9 0	6 30	12 11	3 11	S. ....	12 30	8 9	6 50	12 1	4 4	E. ....	4	6 Ditto ditto ditto, 12 ditto ditto, 4 ditto do.
20	Sunday	1 0	8 7	7 0	13 4	4 9	S. ....	1 30	8 5	7 30	13 7	5 2	N.E. ..	5	7 Ditto ditto ditto, 12 ditto ditto.
21	"	1 50	8 3	7 50	13 9	5 6	S. ....	2 0	8 0	8 0	13 11	5 11	N.E. ..	5	6 Ditto cloudy, 12 P. M. clear, 5 P. M. Cloudy.
22	"	2 30	7 10	8 30	14 2	6 4	N. ....	2 50	7 8	8 50	14 4	6 8	N.E. ..	6	7 Ditto ditto, 8 A. M. drizzling rain, 12 ditto ditto.
23	"	3 0	7 6	9 0	14 6	7 0	N. ....	3 30	7 8	9 30	14 8	7 5	N. ....	5	6 Ditto drizzling rain, 12 P. M. clear throughout, 4 P. M. cloudy.
24	"	3 50	7 0	9 50	14 10	7 10	N.N.W.	4 0	6 10	10 0	15 0	8 2	N. ....	8	6 Ditto cloudy, 12 ditto ditto ditto, 4 ditto ditto.
25	"	4 30	6 8	10 30	15 3	8 7	N.N.W.	4 50	6 6	10 50	15 5	8 11	E. ....	11	7 Ditto clear throughout, 12 ditto drizzling rain with sunshine. 5 P. M. cloudy.
26	"	5 0	6 4	11 0	15 7	9 3	N.N.W.	5 30	6 1	11 30	15 9	9 8	E. ....	8	6 Ditto ditto cloudy, 5 P. M. clear as from N. N. W.
27	Sunday	5 50	6 4	11 50	15 6	9 2	N.N.W.	6 0	6 7	12 0	15 3	8 8	N.N.E.	8	6 Ditto ditto, 5 ditto cloudy.
28	"	6 30	6 10	12 30	14 10	8 0	N.N.W.	6 50	7 3	12 50	14 6	7 3	N.N.W.	7	6 Ditto ditto ditto, 12 A. M. ditto, 2 ditto clear.
29	"	7 0	7 7	1 0	14 1	6 6	N.N.W.	7 30	7 10	1 30	13 10	6 0	N.N.W.	6	6 Ditto drizzling rain, 12 P. M. clear throughout, 5 P. M. cloudy.
30	"	7 50	8 3	1 50	13 7	5 4	N. ....	8 0	8 5	2 0	13 4	4 11	N.N.W.	12	12 P. M. Clear throughout, 6 P. M. cloudy.
31	"	8 30	8 8	2 35	12 10	4 3	N. ....	8 55	8 11	2 55	12 8	3 9	S. ....	3	12 Ditto ditto ditto, all day. (Signed) W. DAWSON.

(Signed) W. DAWSON,

Day.	Morning Tide A. M.						Evening Tide P. M.						Wind.	Range of Tide.	Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.					
	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.					
											Range of Tide.	Wind.			
1	9 0	9 0	3 0	12 6	3 6	S.	9 30	9 2	3 30	12 4	3 2	N.	....	6h. A. M. Clear throughout, 1 1/2 P. M. sultry, 4 P. M. clear.	
2	10 0	9 4	4 0	12 2	2 10	S.	10 30	9 5	4 30	12 0	2 7	N.	....	6 Ditto ditto ditto, 1 1/2 ditto ditto, 3 ditto do.	
3 Sunday,	11 0	9 7	5 0	11 10	2 3	N.	11 30	9 8	5 30	11 8	2 0	N. W.	....	6 Ditto ditto ditto, 1 ditto ditto, 5 ditto do.	
4	12 0	9 10	6 0	11 6	1 8	N.	2 0	9 9	7 0	11 6	1 9	N. E.	....	6 Ditto ditto ditto, 3 ditto cloudy.	
5	3 0	9 6	9 0	11 8	2 2	N. N. W.	3 30	9 4	9 30	11 11	2 7	N.	....	7 Ditto ditto ditto, 1 1/2 ditto sultry, 4 P. M. clear throughout.	
6	4 0	9 3	10 0	12 2	2 11	S.	4 30	9 0	10 30	12 5	3 5	N. N. W.	7	7 Ditto ditto ditto, 9 A. M. cloudy, 1 1/2 P. M. Drizzling rain and strong breezes from N.	
7	5 0	8 9	11 0	12 8	3 11	N.	5 30	8 6	11 30	12 11	4 5	N. E.	..	7 Ditto showers, 1 1/2 P. M. clear throughout	
8	6 0	8 3	12 0	13 1	4 10	N. N. W.	6 30	8 0	12 30	13 4	5 4	S.	....	8 P. M. ditto ditto.	
9	7 0	7 10	1 0	13 7	5 9	S.	7 30	7 7	1 30	13 9	6 2	N.	....	6 Ditto cloudy 8 A. M. drizzling rain till, 6 P. M. ditto, 12 P. M. clear throughout, 4 P. M. cloudy, 5 P. M. drizzling rain and strong breezes from N.	
10 Sunday,	7 30	7 2	1 30	14 0	6 9	S.	8 0	7 0	2 0	14 3	7 3	N.	....	6	
11	8 30	7 0	2 30	14 0	7 0	N.	8 50	7 3	2 50	13 10	6 7	N. E.	..	6	
12	9 0	7 5	3 0	13 8	6 8	N.	9 30	7 8	3 30	13 6	5 10	N. E.	..	6	
13	9 50	7 11	3 50	13 3	5 4	N.	10 0	8 2	4 0	13 0	4 10	N.	....	6	
14	10 30	8 5	4 30	12 9	4 4	N. N. W.	11 0	8 7	5 0	12 7	4 0	N.	....	6	
														5 ditto cloudy. 6 Ditto clear throughout, 1 1/2 P. M. sultry, 5 ditto clear.	

Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India,—January 1841,—(Continued.)

Day.	Morning Tide, A. M.						Range of Tide.	Weather, &c.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	Low Water.		High Water.					N.	N.N.W.	N. ....	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....	N.	N.N.W.	N. ....



Day.	Morning Tide, A. M.						Evening Tide, P. M.						Weather, &c.		
	Low Water.			High Water.			Low Water.			High Water.				Range of Tide.	Wind.
	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.							
1	2 45	9 0	8 45	13 2	3 0	9 2	3 30	13 4	N. E. ...	3	2	6 A. M. clear throughout, 10 A. M. sultry, 6 P. M. clear.			
2	3 25	9 4	9 25	11 10	3 45	9 6	9 45	11 8	N. E. ...	2	2	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
3	4 0	9 8	10 0	11 11	4 30	9 5	10 30	12 2	N. E. ...	2	9	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
4	5 0	9 9	10 50	12 4	5 30	9 4	11 0	12 5	N. E. ...	3	1	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
5	5 50	9 9	11 30	12 7	6 0	8 10	11 50	12 9	N. ...	3	11	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
6	6 30	9 8	12 0	12 11	6 50	8 6	12 30	13 2	N. ...	4	8	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
7 Sunday,	7 0	9 8	12 50	13 4	7 30	8 0	1 0	13 7	N. F. ...	5	7	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
8	7 50	7 10	1 30	13 9	8 0	7 7	1 50	14 0	N. N. E. ...	6	5	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
9	8 30	7 4	2 0	14 0	8 50	7 1	2 30	14 4	N. N. E. ...	7	3	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
10	9 0	7 6	2 50	14 5	9 30	6 6	3 0	14 7	N. ...	8	0	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
11	9 50	6 8	3 30	14 5	10 0	6 11	3 50	14 2	N. W. ...	7	3	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
12	10 30	7 7	4 0	14 0	10 50	7 5	4 30	13 9	N. ...	6	4	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
13	11 0	7 7	4 50	13 6	11 30	8 0	5 0	13 2	N. E. ...	5	2	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
14 Sunday,	11 50	8 3	5 30	13 0	12 0	8 6	6 0	13 8	N. ...	4	2	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
15	12 30	8 9	6 30	12 4	12 50	8 11	6 50	13 1	N. E. ...	3	2	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
16	1 0	8 8	7 0	11 11	1 30	9 4	7 30	11 8	N. E. ...	2	4	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
17	1 50	9 9	7 50	11 6	2 0	9 8	8 0	11 6	N. N. E. ...	1	10	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
18	2 30	9 9	8 30	11 8	2 50	9 3	8 50	11 11	N. N. E. ...	2	8	6 Ditto ditto ditto, 10 ditto ditto, 6 ditto ditto.			
19	3 0	9 9	9 0	12 3	3 30	8 9	9 30	12 6	N. ...	3	9	6 Ditto ditto ditto, 2 P. M. cloudy, 5 P. M. drizzling rain with sunshine.			
20	3 50	8 4	9 50	12 9	4 0	8 1	10 0	13 0	N. N. W. ...	4	11	6 Ditto ditto ditto all day			
21 Sunday,	4 30	7 9	10 30	13 3	4 50	7 7	10 50	13 6	N. N. W. ...	5	11	6 Ditto ditto ditto, 4 P. M. cloudy, 6 P. M. thunder.			
22	5 0	7 4	11 0	13 8	5 30	7 1	11 30	13 11	N. ...	6	10	6 Ditto ditto ditto.			
23	5 50	6 9	11 50	14 2	6 0	6 6	12 0	14 5	N. N. E. ...	7	11	6 Ditto ditto ditto.			
24	6 30	6 8	12 30	14 7	6 45	6 10	12 45	14 8	N. ...	7	10	6 Ditto ditto ditto.			
25	7 0	6 7	1 1	14 4	7 30	7 4	1 30	14 2	N. ...	6	10	6 Ditto ditto ditto.			
26	7 45	7 6	1 45	13 11	8 0	7 9	2 0	13 8	N. E. ...	5	11	6 Ditto ditto ditto.			
27	8 30	7 11	2 30	13 6	8 50	8 3	2 50	13 4	N. E. ...	2	5	6 Ditto ditto ditto.			
28 Sunday,	9 0	8 5	3 0	13 2	9 30	8 8	3 30	13 0	N. N. W. ...	4	4	6 Ditto ditto ditto, 5 P. M. cloudy 6 P. M. thunder. (Signed,) W. DAWSON, Harbour Master.			

*Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India,—March 1841.*

Day.	Morning Tide A. M.					Wind.	Evening Tide P. M.					Range of Tide.	
	Low Water.		High Water.		Range of Tide.		Low Water.		High Water.		Range of Tide.		
	Time.	Height.	Time.	Height.			Time.	Height.					
1	9 50	8 10	3 50	12 10	4 0	N. ....	10 0	9 1	4 0	12 8	3 7	N.N.W.	6 A. M. clear throughout all day.
"	10 20	9 4	4 30	12 6	3 2	N.N.W.	10 50	9 7	4 50	12 4	2 9	N.E. ...	6 Ditto ditto ditto.
"	11 0	9 9	5 0	12 2	2 5	N.N.W.	11 30	9 11	5 30	12 0	2 1	N.E. ...	6 Ditto ditto ditto, 1 P. M. cloudy.
"	11 50	10 1	5 50	11 10	1 9	N. ....	12 0	10 4	6 0	11 8	1 4	E. ....	6 Ditto ditto ditto, 2 ditto ditto.
"	12 20	10 1	6 30	11 11	1 10	N.E. ...	12 50	9 10	6 50	12 2	2 4	N.N.W.	6 Ditto ditto ditto, 1 ditto ditto, 3 P. M. thunder 4 P. M. drizzling rain.
6	1 0	8 9	7 0	12 5	3 8	N.E. ...	1 30	8 6	7 30	12 6	4 2	S. ....	6 Ditto ditto ditto, 12 sultry and drizzling rain, with sunshine.
7 Sunday,	1 50	8 2	7 50	13 0	4 10	N.E. ...	2 0	7 10	8 0	13 4	5 6	N. ....	6 Ditto cloudy throughout, 12 clear, 2 P. M. cloudy, 5 P. M. thunder.
8	2 30	7 7	8 30	13 7	6 0	S. ....	2 50	7 4	8 50	13 11	6 7	N. ....	6 Ditto clear, 12 P. M. sultry and drizzling rain with sunshine, 2 P. M. cloudy, 4 P. M. strong breezes for N. N. E.
9	3 0	7 1	9 0	14 4	7 3	S. ....	3 30	6 9	9 30	14 8	7 11	N. ....	6 Ditto ditto, 12 ditto ditto, P. M. clear.
"	3 50	6 4	9 50	14 11	8 7	N. ....	4 0	6 0	10 0	15 2	9 2	N.N.W.	6 Ditto ditto, 12 ditto ditto, 2 ditto ditto.
"	4 30	6 0	10 30	15 0	9 0	N. ....	4 50	5 1	10 50	14 8	6 7	N.E. ...	6 Ditto ditto throughout, 2 ditto cloudy, 5 P. M. thunder.
12	5 0	6 7	11 0	14 4	7 9	N.E. ...	5 30	6 9	11 30	14 0	7 3	N. ....	6 Ditto ditto, 3 P. M. cloudy.
"	6 0	7 1	12 0	13 11	6 10	N.N.E.	6 45	7 5	12 45	13 9	6 4	N.N.W.	6 Ditto cloudy, 7 A. M. drizzling rain, 12 P. M. clear throughout.
14 Sunday,	7 0	7 8	1 0	13 6	5 10	N.N.W.	7 40	7 11	1 40	13 3	5 4	N.E. ...	6 Ditto ditto, 12 P. M. clear, 3 P. M. cloudy, 5 P. M. ditto ditto.
15	8 0	8 2	2 0	13 0	4 10	S. ....	8 45	8 5	2 45	12 9	4 4	N. ....	6 Ditto clear throughout, 12 P. M. sultry, 4 P. M. clear throughout.
"	9 0	8 8	3 0	12 8	3 10	S. ....	9 40	8 11	3 45	12 3	3 4	N. ....	6 Ditto do. do. 12 do. do. 4 do. do. do.

Day.	Morning Tide A. M.					Evening Tide P. M.				
	Low Water.		High Water.		Wind.	Low water.		High Water.		Range of Tide.
	Time.	Height.	Time.	Height.		Time.	Height.	Time.	Height.	
17	12 0	9 2	7 0	12 1	S.....	1 0	9 6	8 0	11 10	2 4 N.N.W.
"										6 A. M. cloudy, 12 P. M. clear, 5 P. M. cloudy.
18	3 0	9 6	8 30	12 2	N.....	2 30	9 3	8 50	12 5	3 2 E.....
"										6 Ditto clear throughout, 12 P. M. sultry.
19	3 0	9 0	9 0	12 9	N.E....	3 30	8 7	9 30	13 3	4 8 N.N.W.
"										6 Ditto ditto, 2 ditto cloudy.
20	3 50	7 6	9 50	13 8	N.....	4 0	7 4	10 0	14 1	6 9 S.....
"										6 Ditto ditto, 2 ditto ditto, 3 P. M. drizzling rain.
21 Sunday,	4 30	7 2	10 30	14 5	S.....	4 50	7 10	10 50	14 9	6 11 N.N.W.
"										6 Ditto cloudy and showers strong breezes from S. 1 P. M. drizzling rain.
22	5 0	6 10	11 0	15 3	N.N.W.	5 30	6 8	11 30	15 7	8 11 N.E....
"										6 Ditto P. M.
23	5 50	6 6	11 50	15 11	N.N.W.	6 0	6 4	12 0	16 3	9 11 N.....
"										6 Ditto
24	6 30	6 2	12 30	16 6	N.E....	6 50	6 0	12 50	16 8	10 8 N.....
"										6 Ditto P. M.
25	7 0	6 0	1 0	17 3	N.....	7 30	6 5	1 30	17 6	11 1 N.N.E.
"										6 Ditto clear, 4 P. M. cloudy.
26	7 20	6 8	1 50	17 0	N.E....	8 0	7 3	2 0	16 8	9 5 S.....
"										6 Ditto ditto, 12 ditto sultry, 4 P. M. clear throughout.
27	8 30	7 8	2 30	16 4	N.....	8 50	7 11	2 50	16 0	8 1 S.....
"										6 Ditto ditto throughout, 2 ditto cloudy.
28 Sunday,	9 0	7 11	3 0	15 8	N.N.W.	9 30	8 3	3 35	15 4	7 1 N.....
"										6 Ditto cloudy, 12 ditto clear.
29	9 50	8 6	3 50	15 0	S.....	10 0	8 10	4 0	14 8	5 10 N.N.W.
"										6 Ditto clear, 12 ditto cloudy, 3 P. M. drizzling rain.
30	10 30	9 2	4 30	14 4	S.....	10 50	9 7	4 50	14 0	4 5 N.....
"										6 Ditto ditto, 12 ditto, 1 ditto showers.
31	11 0	9 10	5 0	13 0	N.N.W.	11 30	10 2	5 30	13 4	3 2 N.N.E.
"										6 Ditto ditto, 12 ditto sultry, 1 ditto cloudy, 3 P. M. showers and thunder.

W. A. DAWSON,  
Harbour Master.  
(Signed.)

*Notes on various Indian and Malayan Birds, with Descriptions of some presumed new Species.* By EDWARD BLYTH, Curator to the Museum of the Asiatic Society.

A highly interesting collection of bird-skins, from Darjeeling, having been kindly entrusted to my charge by Dr. Pearson, for the purpose of describing, or otherwise noticing such among them as I may consider to be new, or worthy of some remark, I avail myself of the occasion not only to respond to the wishes of that gentleman, but to record a variety of observations upon other Indian and Malayan species of birds, which have recently fallen under my notice.

1. *Falco Aldrovandi*, Reinwardt, Tem. *Pl. Col.* 128; *F. severus*, Horsfield, *Lin. Trans.* XIII. 135; *F. subbuteo* (?), Franklin, *Proc. Zool. Soc.* 1831, 114. (RED-BELLIED FALCON.) Nearly allied to the Hobby Falcon (*F. subbuteo*). Length of a male about  $10\frac{1}{2}$  inches; of wing  $8\frac{1}{2}$  inches, and tail  $4\frac{1}{2}$  inches; bill to forehead, including cere,  $\frac{3}{4}$  inch over the curve, and rather more from point of upper mandible to gape; tarse posteriorly 1 inch, and middle toe and claw  $1\frac{1}{2}$  inch. Colour above uniform dusky-black, with a very slight greyish cast, which is chiefly visible upon the back, and also on the tail, the medial feathers of which are obscurely barred with black, which colour extends down their middle; inner webs of the other tail-feathers having seven or eight well defined rufous bars, which also appear more or less on their exterior webs, excepting on the outermost; feathers at the sides of the back of the neck rufous, excepting at the tip, which colour indeed extends on the inner web to the tip in a very few, so that this rufous is always more or less visible: throat and front of the neck clear fulvous-white; the lores, cheeks, and ear-coverts, black like the crown: rest of the under-parts, sides, and inside of the wings to the greater quills, deep ferruginous, comparatively dilute on the breast, and each feather having a medial black stripe or spot: primaries barred for two-thirds of their length on the inner web with a series of transverse rufous spots: bill dusky-bluish, the lower mandible yellow except at the tip: legs bright yellow: all the tail-feathers are narrowly tipped with rufous-white; and the scapularies, tertiaries, and larger wing-coverts are

very slightly edged with the same. The female exceeds 11 inches long, with wings  $9\frac{1}{2}$  inches, and tail  $5\frac{1}{2}$  inches; colour of the upper-parts much less dark, or of a dusky brownish-slaty hue, slightly margined with greyish-brown especially on the scapularies, tertiaries, and larger wing-coverts, and more broadly on the upper tail-coverts: tail tipped with the same, having a slight tinge of rufous; its middle feathers greyish-dusky, with all but obsolete darker bars, and the rest marked as in the male, but with paler rufous: spot at each side of the lower part of the back of the neck whitish, and a blackish moustache separated from the black-brown of the cheeks, instead of the intervening space being filled up with black as in the male; there is also a narrow fulvous-white streak over the eye, and the frontal feathers immediately over the beak are whitish: the lower parts are but faintly tinged with ferruginous, which is deepest on the thighs, and marked with larger black spots and streaks than in the other sex: primaries barred on the inner web with very faint ferruginous. A young female has considerably more white on the forehead, and the feathers of the crown and occiput are dark brownish, marked with a dusky streak along the shaft: moustache much less developed, the black merely occupying the outer web, or only the shaft, of each feather: upper-parts dusky-brown, more broadly margined with rufous than in the preceding; the tips of the secondaries and of the inner webs of the primaries edged with white; middle tail-feathers greyish, distinctly banded with pale dusky; the exterior successively more fulvous, and with darker bars of a more mottled character than in the adult: upon the inner webs the fulvous is much fainter than in the mature female: the primaries have a series of large transverse oval white spots on the basal two-thirds of their inner webs; and the under-parts are still less tinged with ferruginous, which is all but confined to the belly, thighs, and under tail-coverts, these parts being nearly without markings, while the breast and sides are streaked longitudinally with blackish-brown, forming larger, but less defined, markings than in the adult; the wings of this specimen are  $9\frac{1}{2}$  inches long.

The handsome male here described is from Darjeeling; and both females are old specimens in the Museum of the Asiatic Society, procured in the neighbourhood of Calcutta. I have seen no notice of this

bird inhabiting India, but suspect that Major Franklin's *F. subbuteo* refers to no other.\* In Java it is not uncommon.

2. *Syrnium Sinense*: *Strix Sinensis*, Latham, *Ind. Orn., Supp.*, p. 61; *Str. orientalis*, Shaw, *Zool.*, VII, 257; and figured by Hardwicke and Gray, *Ill. Ind. Zool.* A young bird, in full-grown nestling plumage;

\* Since the above was written, Mr. Jerdon has kindly favored me with a copy of the printed *Supplement* to his valuable Catalogue of the Birds of Peninsular India, and with a collection of beautiful coloured drawings of many of the species. Among them is one of a bird referred by that gentleman to *F. Subbuteo*, and noticed as such in his *Supplement*; but it exactly agrees with my female above described, and is distinct from the European Hobby. "I obtained a single specimen of this Falcon," he informs us, "during the cold season, in a grove of trees North of Jaulnah. I found its stomach crammed with *Libellula*. It was called *Doureylee* by one native falconer, and *Reygee* by another, who said it was only a cold weather visitant in the Peninsula, coming in and disappearing along with the *Bhyree* (*F. peregrinus*.)"

The same naturalist has also furnished me with the following description of a small Falcon, recently procured by him upon the Neilghierries in January, and which I somewhat incline to think can be no other than the present in a different state of plumage, being probably the immature male. "Length  $11\frac{1}{2}$  inches, of wing  $9\frac{1}{2}$  inches, and tail 5 inches; extent 27 inches. Bill deep fleshy-red, the tip dusky; cere and legs deep orange-red; claws fleshy; irides deep brown; orbital skin orange yellow. Above dark slaty-grey, some of the feathers centred and tipped darker; the dorsal edged with rusty: tail light grey obsoletely barred: ocular region and cheek-stripe nearly black: narrow frontal band, supercilium, chin, throat, ear-feathers and sides of the neck, white; breast and abdomen rusty-white with blackish-brown marks, longitudinal on breast, heart-shaped on the sides, and narrow and arrow-like on the centre of the abdomen: vent, under tail-coverts, and thigh-coverts, pale unspotted rusty. Habit, insectivorous."

The name *Falco Aldrovandi*, I perceive, is applied by this ornithologist in his *Supplement* to the *Shaheen*, (his previous *F. Shaheen*,) with the remark, that he "was misled by the description in Griffith's Cuvier (where it is stated to be only 10 inches long) to consider it undescribed." In the *Dict. Class. d'Hist. Nat.*, however, I also find *F. Aldrovandi* stated to be  $10\frac{1}{2}$  inches in length, and Temminck's plate above cited is referred to: again, in Stephens's continuation to Shaw's *Zoology* (xiii, pt. ii. 40), *F. Aldrovandi*, Tem., is doubtfully identified with *F. severus*, Horsfield, the length of which, as copied from the latter naturalist, is given as the same. Finally, referring to Dr. Horsfield's amended list of Javanese birds prefixed to his *Zoological Researches in Java*, I again perceive that *F. Aldrovandi* is identified with *F. severus*. On the other hand, Mr. Walter Elliot remarks, that the *Shaheen* is correctly figured by Temminck as *F. Aldrovandi*; this *Shaheen* measuring from nearly 15 to  $19\frac{1}{2}$  inches long, according to the sex, and bearing no particular resemblance to the present species in its colouring.

At all events, I suspect that *F. Subbuteo* may be safely expunged from the list of Indian birds hitherto ascertained, the more especially as Mr. Jerdon has certainly mistaken our present species for it, as I presumed Major Franklin had done. Another small Falcon, which I have lately obtained in the vicinity of Calcutta, is *F. Timen-culoides*, Tem., which is figured, too, in one of the coloured drawings of the late Dr. Buchanan Hamilton.

which exactly corresponds with the first dress of the European *S. Aluco*, and certainly cannot represent the *Strix Indranea*, Sykes (*Proc. Zool. Soc.*, 1832, 82), as suspected by Mr. Jerdon (*Madr. Jour.*, No. XXIV, 88), who further inclines to identify this species with *Str. pagodarum*, Tem. (*Pl. Col.* 230), or *Str. Seloputo*, Horsfield (*Lin. Trans.* XIII, 140), which, to judge from the description in Shaw's *Zoology* (XIII, 65), seems to me inadmissible. Mr. Jerdon observed a single specimen "in a tope, and some large single trees, near Verdupettah, to the south of Madura, on the Palamcottah road," and the dimensions he has given accord with those assigned by Col. Sykes to his *Strix Indranea*, and exceed those of the immature specimen before me in the degree to be expected. I annex a description. Length  $15\frac{1}{2}$  inches, of wing from bend 11 inches, tail 7 inches; tarse 2 inches. Bill straw yellow, at base dusky, where impended by bristle-like feathers, barbed and of a brown colour only at base, the rest black; face rufous-brown, with pale shafts to the feathers, and a little mixed with blackish; the disk, anterior to the ears, shining brown-black, and posterior to them marked with rufous-brown near the ends of the feathers: plumage of the crown, neck, shoulders, and under-parts, with the tail-coverts, extremely flimsy and of downy texture; the scapularies and interscapularies firmer and more adult-looking, though also very slight: wings and tail as in the adult: crown, with the back and sides of the neck, dusky-brown tipped with whitish, and towards the shoulders shewing a fulvous bar on each feather; throat and breast less conspicuously whitish-tipped, the latter having two fulvous bands on each feather; rest of the under-parts dull fulvous barred with dusky, and many adult feathers appearing on the back and breast.

3. *Athene Brodiei*: *Noctua Brodiei*, Burton, *P. Z. S.*, 1835, 152; *N. tubiger*, Hodgson, *As. Res.*, XIX, 175. (COLLARED OWLET.) This very diminutive species is nearly allied to the common *Ath. cuculoides*, but is much smaller, an adult male measuring but  $6\frac{1}{2}$  inches in total length, wing from bend  $3\frac{1}{4}$  inches, and tail  $2\frac{1}{4}$  inches; tarse posteriorly  $\frac{1}{2}$  inch. A rather larger specimen, which I presume to be a female, measures 7 inches long; wing from bend  $3\frac{7}{8}$  inches, and tail  $2\frac{3}{4}$  inches: this latter is a young bird, retaining its nestling feathers on the head and neck, with a few elsewhere. Plumage of the male similar to that of *Ath. cuculoides* upon the back, wings, and tail, the last, however, having its pale bars more of a fulvous hue; head and neck dusky, with the pale bars more

clearly defined and contrasting than in *C. cuculoides*, having also more the appearance of spots; on the lower part of the hind-neck is a conspicuous broad fulvous collar tipped with black, and impended by some white feathers over the middle, and a few black ones laterally; throat white, tinged with straw-yellow, and middle of the whole underparts the same, broadly streaked with brown on the inner webs of the feathers of the belly; breast and sides marked nearly as in *Ath. cuculoides*, but the barrings more brightly contrasted: tibia and tarsus clothed with short dusky feathers, mottled with whitish; but only a few scattered hairs on the toes, which had evidently been bright yellow, as is also the bill. The young (presumed) female is pure white underneath where the male is yellowish, but in other respects generally similar: the uncast nestling feathers are uniform dull greyish brown on the head and neck, each having a pale speck on its shaft, and being of the ordinary flimsy texture; while those of the back and sides of the breast are purer brown, with obscure mottlings; bill partly dusky.

A singular character of this handsome little species consists in the extraordinary prolongation of its *nares*, forming a tubular external cell, no trace of which appears in the allied species\*: in all other respects, it is, however, much too nearly related to *Ath. cuculoides*, &c., to permit of generic separation. The specimens described are from Darjeeling.

The species of these small Indian Owls are rather numerous. Another allied to *Ath. cuculoides*, is described by Mr. Gould, *Proc. Zool. Soc.* 1837, 136, by the name of *Ath. erythropterus*; but it had previously been described by Lieut. Tickell, in *Journ. As. Soc.* II. 572, as *Strix radiata*, and some account of its habits is given by that gentleman: there is also an excellent coloured portrait of this species among the drawings of the late Dr. Buchanan Hamilton, who styles it *Strix undulata*.†

Another member of the same group would seem to exist in the *Strix castanoptera* of Dr. Horsfield, *Lin. Trans.* XIII. 140; where also, among these small tuftless Owls, is described *Strix rufescens*,‡ Horsfield, and at

\* This was written before I met with Mr. Hodgson's description of the species.—B. B.

† Specimens of the male and female of this species, from Chyebassa, have been presented to the Asiatic Society by Lieut. Tickell since the above was written; as also an example of *Ath. Brodiei*, killed in Upper Bengal, by Mr. Frith.

‡ In his catalogue of birds prefixed to the 'Zoological Researches in Java,' Dr. Horsfield questions the distinctness of this from *Scops Javanicus*, Lesson, or *Sc. Lempiji*, Horsfield; one of the tufted species.



page 280 of the same volume, the *Strix scutellata*, Raffles (the legs of which are stated to be "feathered to the toes," whence the applicability of the name bestowed is not very manifest, unless it allude to the toes only). Referring to the *Appendix* to Shaw's Zoology, we also find noticed the *Noctua Sonnerati*, Tem., *N. hirsuta*, Tem., and *N. Brama*, Tem., which last is the *N. Indica*, Franklin (*Proc. Zool. Soc.*, 1831, 115), and is common in this neighbourhood, where likewise occurs the *Strix lugubris*, Tickell (*Jour. As. Soc.*, II. 572).

A *Noctua Tarayensis*, nearly allied to *cuculoides*, is also described by Mr. Hodgson, *As. Res.* XIX. 175, together with the *Brodiei* (v. *tubiger*, H.) and two species of *Scops*, which may have to be added to *Sc. Lempiji*, Horsfield, *Lin. Trans.* XIII. 140.

4. *Picus (Dendrocopus) Himalayanus*, Jardine and Selby, *Ill. Orn.* pl. CXVI., representing the unmoulted young male. (BLACK-BACKED WOODPECKER.) I am not aware that the adults of this species have ever been described. It is closely allied to the European *P. major*, from which it differs in various details, and the adult to a greater extent than the young bird, which latter has the under-parts *streakless* pale dingy fulvous-brown, and the entire crown tipped with red in the male, but not in the female, whereas both sexes of the young of *P. major* have the crown thus tipped. The adult male, as in *P. major*, is distinguished from the other sex by having a glossy crimson occiput. Length  $9\frac{3}{4}$  inches, the female rather less; from wing to bend respectively  $5\frac{1}{2}$  and 5 inches; and tail  $3\frac{1}{2}$  inches: bill to forehead  $1\frac{1}{4}$  inch, and tarse  $\frac{3}{4}$  inch. All the upper-parts, save the crimson occiput of the male, fine glossy black, with a great white wing-spot formed by the tertiary-coverts, and less developed in the male than in the female and young: four middle tail-feathers wholly black, the rest successively more barred with fulvous-white: the large feathers of the wing, except the two first primaries, marked with white spots on their outer webs, and with larger white spots on the inner web: vent and lower tail-coverts crimson: under-parts from the breast golden fulvous-brown (in the adult), having a broadish black streak along the middle of each feather, becoming obsolete on the middle of the belly: throat and fore-neck dingy-fulvous, flanked by a black line extending from the side of the lower mandible to the shoulder; above this line is a triangular patch of golden-fulvous impeding the shoulder, and continued forward (generally without inter-

ruption) to the ear-coverts, which are paler; a band of the same crosses the forehead, immediately over the bill, and is continued backward to the ear-coverts, surrounding the eye: bill dull leaden-blue, passing into dusky towards the tip; and feet leaden-brown. The young have no streaks whatever on the under-parts, which are less tinged with golden, and incline to rufous on the breast; their back is somewhat brownish, and the triangular patch over the shoulders dull white: a specimen before me in this dress differs only from Messrs. Jardine and Selby's figure in having no crimson on the crown, whence I conclude it to be a female, and that represented to be a male. An inhabitant of Darjeeling and other districts of the Himalaya.

5. *Indicator xanthonotus*, Nobis. (GOLDEN-BACKED HONEYGUIDE). The discovery of this species upon the Himalaya is of some interest, as all its congeners heretofore known are inhabitants of Africa only. Structure typical: length of a female  $5\frac{7}{8}$ , or probably 6 inches when recent; of wing from bend  $3\frac{3}{8}$  inches; and tail  $2\frac{1}{4}$  inches; bill from forehead  $\frac{1}{4}$  inch, and above  $\frac{7}{16}$  inch from gape; tarse  $\frac{1}{2}$  inch; 2nd and 3rd quills equal and longest, the 1st and 4th a little shorter, and also equal: outermost pair of tail feathers  $\frac{3}{4}$  inch shorter, and penultimate pair  $\frac{1}{4}$  inch shorter, than the rest, which latter are subequal: bill short and Finch-like, of a triangular shape viewed from above, the ridge of the upper mandible nearly obsolete, and its outline much curved; that of the lower mandible less so. Forehead and lower part of the cheeks golden-yellow; throat tinged with the same: crown and back of the neck dull olive-green, as also the front of the neck, which is slightly tinged with yellow: breast dusky-ash, the middle of each feather somewhat darker; belly and thighs albescent, with a medial dusky streak to each plume: lower tail-coverts and above the tibiae dull black, with lateral whitish margins: wings, scapularies, and interscapularies, dusky-black, laterally margined with yellowish olive-green, obsolete on the outer primaries, and the tertiaries margined on their inner webs with white: tail and its upper coverts black, the uropygials and largest medial pair of coverts edged on the inner web with grey, and the small external pair of tail-feathers obliquely marked with whitish at the tip: broad medial line along the rump bright golden-yellow, changing to fine sulphur-yellow on the back under the interscapularies, where the feathers are discomposed, silky, and hair-like, somewhat resembling those of the centre of the crest of

a typical *Regulus*, but straighter and less downy; sides of the rump, bordering the broad yellow stripe, black; and the wings underneath whitish tinged with yellow, the feathers of downy texture: beak horny-brown, the lower mandible paler; and legs apparently dark-greenish. From Darjeeling, where stated to be very rare.

The affinities of this genus I have long considered to be with the Woodpeckers, and not with the Cuckoos: their feet are formed exactly as in the former group, not as in the latter; and they are accordingly known to climb the boles of trees, in the cavities of which they deposit numerous shining white eggs, wherein also they resemble the Woodpeckers. I am unacquainted with the conformation of their soft parts, further than that the traveller Bruce informs us, of his "Bee Cuckoo," (*Appendix* to 'Travels to discover the source of the Nile,' v. 179), that "the tongue is sharp-pointed, can be drawn to almost half its length out of the mouth beyond the point of the beak, and is very flexible," a statement which I did not remark until long after I had arrived at the opinion here expressed. If my view be correct, it will probably be further confirmed by the stomach proving to have its muscular coat considerably more developed than in the Cuckoos; by the absence of *cæca*, as in the Woodpeckers (normally\*), these existing in all the Cuckoo tribe which I have examined; and by the sternal apparatus, the form of which is very different in the Woodpeckers and Wryneck from what it is in the Cuckoos. The Barbets (*Bucco*) are quite distinct from either, and more nearly allied in internal conformation to the South American group of Toucans (*Ramphastidae*), which they even resemble in the peculiar character of having short imperfect clavicles; while the African group of Touracos (*Musophagidae*), also allied, is remarkable for having the clavicles fully developed, but permanently joined together by cartilage only to constitute the furcula, as I have observed in three different species.

6. *Bucco Franklinii*, Nobis, (FRANKLIN'S BARBERT.) Allied to *B. cyanops*. Length 8 inches, of wing  $3\frac{1}{2}$  inches, and tail  $2\frac{1}{4}$  inches: bill to forehead  $\frac{13}{16}$  inch, and to hind-angle of upper mandible  $1\frac{1}{16}$  inch; tarse  $\frac{7}{8}$  inch. Colour of the upper-parts vivid-green, of the under paler and

\* Professor Owen once remarked the presence of *cæca* in a specimen of the British Green Woodpecker (*Picus viridis*), several of which same species I have since examined without finding any.—E. B.

more yellowish-green; edge and shoulder of the wing deep blue, and its under surface marked with pale buff-yellow as in *B. cyanops*; forehead and occiput crimson; the crown and throat bright glistening orange: around the eye black, continued backward to the sides of the occiput, where mixed with green: the ear-coverts were being moulted in the specimen, but appear to be coming of a mixed green and blue, and the feathers growing at the base of the lower mandible are crimson. Bill dusky-black, whitish at base of lower mandible; and legs evidently greenish, or a sort of lead-colour tinged with green, as in *B. cyanops*: tail also, as in that species, verditer underneath. From Darjeeling; and dedicated to Major James Franklin, F. R. S., &c., a highly meritorious pioneer among the investigators of Indian Ornithology, whose still useful "Catalogue of Birds collected on the Ganges between Calcutta and Benares, and in the Vindhyan hills between the latter place and Gurra Mundela, on the Nurbudda," is published in the Proceedings of the Zoological Society for 1835, pp. 114 to 125, and republished in the Journal of the Asiatic Society, I, 260 et seq.

7. *Cuculus micropterus*, Gould, *Proc. Zool. Soc.* 1837, 137. The *Bocuttácko* of Bengal, so named from its cry.\*

8. *C. Sonneratii*, Latham, *Ind. Orn.* II. 215; *le petit Coucou des Indes*, Sonnerat, *Voy. Ind.* IV. 216; *C. Himalayanus*, Vigors, *Proc. Zool. Soc.* 1831, 172, Gould's *Century*, Pl. LIV: all these notices referring to the female. I have a monograph of the Indian *Cuculidæ* in preparation, and therefore defer for the present what remarks I have to offer on this and the preceding species.

9. *Trogon Hodgsonii*? Gould (I have no description to refer to): *Tr. fasciatus*, Var. A., Latham, *Gen. Hist. Birds*, III. 213; but having no white pectoral bar: marked female. Length nearly 13 inches, of wing from bend 6 inches, and middle tail feathers  $7\frac{1}{2}$  inches, the outermost 3 inches shorter. Colour of the upper parts, neck and breast, deep chestnut-brown, darkest on the head, and brightening to the rump and upper tail-coverts; belly crimson: smaller wing-coverts and tertiaries externally, finely undulated black and brown, the rest of the wing blackish with

\* The Asiatic Society has received this species from the Malay peninsula, and it is included in Mr. Vigne's catalogue of his collection of birds procured in Kashmir and Little Tibet, (*Proc. Zool. Soc.*, January 26, 1841.)

white exterior margins to most of the primaries ; tail as in *Tr. erythrocephalus* and *Tr. Malabaricus* (vide *P. Z. S.*, 1834, 25-6).

10. *Edolius Crishna*, Gould, *P. Z. S.*, 1836, 5; *Corvus Crishna*, Buchanan Hamilton; *Crishna Crow*, Latham, *Gen. Hist. Birds*, III, 51; *Criniger splendens*, Tickell, *J. A. S.*, II, 574; *Cometes* (olim *Chibia*) *casia*, Hodgson, *Ind. Rev.* 1837, 324, and *J. A. S.*, 1841, 29. (HAIR-CRESTED DRONGO). This remarkable and handsome species is not rare about Calcutta, but would appear to be more common in all three regions of Nepál, and there is a specimen in the collection from Darjeeling.

11. *E. remifer*, Tem. *Pl. Col.* 178, apud Shaw's *Zoology*, XIII. part 2, 140. Mr. Jerdon, I presume, means this by the term *retifer* (probably a misprint), which he includes in his valuable catalogue of the birds of Peninsular India (*Madr. Jour.* No. xxv. 241); but he adds *L. Malabaricus*, Shaw, as a synonym, which name is founded on an erroneous identification of two species, and has since been currently bestowed on a third distinct from both, as all are from the present one. This (which is not likely to be Mr. Jerdon's bird) is distinguished from every other known to me, with the exception of one described by Mr. Hodgson (*Ind. Rev.*, 1837, 325-6), by having the terminal 4 inches of the prolonged naked shafts of its outermost tail-feathers barbed equally on both sides ; while from Mr. Hodgson's *Melisseus* (olim *Bhringae*) *tectirostris*, as described by that naturalist, it differs in the Shrike-like form of its bill, the upper mandible of which is strongly hooked, in the comparative shortness of its tarse, and in the feathers of its crown and occiput being of a scale-like form, and not lanceolate like those of the neck : length 10 inches, of wing from bend  $5\frac{1}{4}$  inches, and tail 5 inches, being even at the tip, except that the vanes of the outermost feather on each side are shorter than the rest, while the shaft is prolonged and barbless for 8 inches, having then 4 inches of barb as described, 1 inch in width ; moreover, these stems and barbed tips are straight, without any tendency to spire, as in most of the other species. Bill to forehead  $\frac{1}{2}$  inch in a straight line, the tip of the upper mandible much hooked, and its base impended by an elevated ridge of recurved feathers, successively longer to the front : tarse  $\frac{3}{4}$  inch. Colour altogether richly steeled black, with a brilliant metallic shine, the coronal feathers scale-like, the nuchal hackled, and the pectoral intermediate.

Among the racket-tailed species in the Asiatic Society's Museum, I distinguish the following :—

*E. grandis*, Gould, *P. Z. S.*, 1836, 5; *Cometes* (olim *Chibia*) *Malabaroides*, Hodgson, *Ind. Rev.*, 1837, 325; *E. Malabaricus*, Shaw's *Zoology*, VII, 293, and figured in Stephens's *Appendix* to the same, Vol. XIII, Part II, 140, which figure is taken from Latham's *General History of Birds*, II, 57, where it would seem to have been copied from one of Lady Impey's drawings alluded to in the text, as differing somewhat from the species there described. Shaw erroneously identifies his bird with "le Grand Gobe-mouche de la côte de Malabar" of Sonnerat (*Voy.* iv, 162); and Sonnerat identifies his species as that noticed by Buffon "sous le nom de Drongo de la côte de Malabar:" referring then to Buffon (*Oiseaux*, iv, 587), we read, "On trouve aussi une espèce de Drongo, à la côte de Malabar, d'où il nous a été envoyé par M. Sonnerat; il est un peu plus grand que celui de Madagascar ou de la Chine; il a comme eux le plumage entièrement noir; mais il a le bec plus fort et plus épais, il manque de huppe, et le caractère qui le distingue le plus, consiste" in the prolonged shafts of the exterior tail-feathers, &c. Hence the *Malabar Shrike* of Sonnerat, or *Malabar Drongo* of Buffon, is not the *Lanius Malabaricus* of Shaw, who informs us, that "on the head, springing immediately above the base of the upper mandible, is a large rising tuft, consisting of many plumes of different lengths, and much resembling that of the Rose-coloured Ousel:" now this applies distinctly to the *E. grandis*, Gould, wherein the frontal feathers recline backward over the occiput; but it will not apply to the species referred to by Mr. Gould as *E. Malabaricus*, which again is different from that of Sonnerat and Buffon; the latter being probably the *E. Rangoonensis*, Gould, which, it may be suspected, is also Mr. Jerdon's species. Under these circumstances, I conceive that the specific term *Malabaricus* had much better be disused altogether, for which reason I have headed this notice with the more appropriate name bestowed on the present species by Mr. Gould. The following is a description of the specimen before me. Length, to extremity of penultimate tail feathers, 14 inches; of wing from bend  $6\frac{3}{4}$  inches; of middle tail feather  $5\frac{1}{2}$  inches; of penultimate  $6\frac{3}{4}$  inches, and the shaft of the outermost extending 8 inches beyond, having the terminal  $3\frac{3}{4}$  inches barbed externally, but towards the tip only on the inner web, and spiring inward till the under-surface becomes uppermost

at the tip: bill to forehead  $\frac{5}{16}$  inch, and to gape above  $1\frac{1}{2}$  inch; very feebly hooked, and rather less compressed than in the next species: tarse 1 inch, hind-toe and claw rather more. Frontal crest about twice the length of that of *E. cristatellus* (Nobis), measuring fully  $2\frac{1}{4}$  inches, and reclining back beyond the occiput: coronal feathers slightly hackled, the occipital and nuchal strongly so, and those on the fore-neck shaped as on the crown. Plumage generally somewhat loose and puffy: and colour uniformly black, with a steel-blue gloss. I have seen this species alive, in the possession of a native. Its song is very fine; loud and sonorous, with the deep tone of the European Blackbird. The specimen described is from Tenasserim; and the species is known to range from Nepál and Assam to Sumatra.

*E. cristatellus*, Nobis; *E. Malabaricus* of Gould and most recent authors, but not of Shaw, nor the *Malabar Drongo* or *Shrike* of Buffon and Sonnerat. Shaw's species, it would seem, remained unnoticed for a long period, during which the name *Malabaricus* came to be applied to the present nearly allied one, but it remains to be shewn that either of these inhabits the Malabar coast, or any part of the Indian peninsula. That now under consideration is inferior in size to the preceding, with frontal crest but half as long, and vaguely comparable to that of *Pastor cristatellus*, as the crest of *E. grandis* has been compared to that of *P. rufus*: in the finest specimens, when pressed down, this barely reaches to the occiput, and as usually elevated it does not recline beyond the middle of the head, its longest feathers measuring generally under  $1\frac{1}{4}$  inch. Length, to extremity of penultimate tail feather, 13 inches or somewhat less; of wing from bend  $5\frac{3}{4}$  to  $6\frac{1}{4}$  inches, and middle tail feathers  $5\frac{3}{4}$  to 6 inches, the penultimate  $6\frac{1}{2}$  to  $6\frac{3}{4}$  inches, and the prolonged stem and terminal barb of the outermost with its amount of twirl the same as in *E. grandis*. Plumage also generally similar, with the exception of the crest, the shorter feathers of which describe an equal curvature to the longer ones of *E. grandis*. The young differ only in the looser texture of their feathers, which underneath and on the rump are glossless fuscous, while the forehead is not more crested than in the next species, and the feathers of the crown and neck are not hackled, but of flimsy texture and rounded at the tips, where alone they are glossed: the greater length of the tail readily distinguishes them from the species next noticed; and the specimens here described are from the Tenasserim coast.

*E. Rangoonensis*, Gould, *Proc. Zool. Soc.* 1836, 5. "Distinguishable from *E. Malabaricus* [*subcristatus*], to which it is nearly allied, by its shorter beak, and by the *total absence* from its forehead of the fine curled plumes which decorate that bird; the wing also is somewhat shorter." Gould, *loc. cit.* In the catalogue of Dr. McClelland's birds from Assam, however, Dr. Horsfield writes: "One of our specimens agrees accurately with Mr. Gould's specific character; in two others, *the crest is less developed*, and the lanceolate plumes on the throat are less prominent" (*Proc. Zool. Soc.* 1839, 158). Mr. Gould's description is as follows: "*E. ater viridi splendens; rectricum externarum scapis longissimis, vexillis latè spatulatis ad apicis marginem anteriorem præditis. Long. tot. (rectricibus externis exclusis), 12 unc; rostri, 1¼; alæ, 6; caudæ, 5½; tarsi, 1.*" The expression "*ater viridi metallicè splendens*" occurs also in Mr. Gould's definition of *E. grandis*; and a slight cast of green is certainly discernible, more especially on the back, upon all three of the closely allied species before me, one of which (judging from the *aggregate* of the foregoing notices) I presume to be referrible to this *Rangoonensis*. Length as described, the middle caudal feather 5½ inches, or but 4¾ inches in another specimen, and penultimate 6 inches and 4¾ inches; wing from bend 5¾ and 5½ inches; and bill to gape 1¾ inch, that of *E. cristatellus* measuring 1½ inch, and sometimes rather more; the crest is hardly less developed than in *Pastor cristatellus*, or it may be compared to that of *E. remifer*, but partakes more of the character of that of *E. cristatellus*, and the nostrils are more densely impended by recumbent plumes than in either of the two species last described. One specimen has its outermost tail-feathers prolonged 12 inches beyond the next, and the naked shaft makes one complete spiral turn, and the barbed extremity another, twirling till its upper surface is again brought upward at the tip; the other specimen has much shorter naked shafts and barbs, and the spirature is less, though still very decided. This twist of the outermost tail-feathers is common to many species of this strongly marked genus, is very perceptible in a slight degree in the common *D. balicassius*, and is most curiously exemplified in *D. Crishna*. The plumage of *E. Rangoonensis* resembles that of the allied species, and the specimens here described are also from Tenasserim.

In the catalogue before cited of Dr. McClelland's Assam birds, the *E. grandis* is also included, with the remark, that "several specimens



of this bird received from Assam agree with the specific character and description given by Mr. Gould, in all points excepting the size, being about one-third smaller; but further observations are required to determine with precision the points by which the long-tailed *Edolii* are to be discriminated." *Horsfield*.

Together with the three allied species here noticed, Mr. Gould described one without the racket-tail, by the appellation *E. viridescens*, as follows: "*E. intensé splendenti chalybeo-viridis, supra magis saturatus. Long. tot. 11 unc; rostri, 1¼; alæ, 5½; caudæ, 5; tarsi, 1. Habitat apud Manillam:*" the form of the bill (so variable in this genus), of the tail, the structure of the plumage, and how to distinguish it from the allied species, are left to be guessed at; but as the tail is not mentioned to be forked, we may suppose that it is square, and if so, there is a specimen in the Asiatic Society's Museum, which may be presumed to represent this species. Length as described, or a trifle less; of wing do., and outermost tail-feather do., the medial 4½ inches: bill to forehead  $1\frac{1}{16}$  inch, to gape  $1\frac{7}{16}$  inch, in shape similar to that of *E. cristatellus*, but rather more compressed, and very densely impended at base by short and unelevated reflected feathers, scarcely lengthened in front as in *E. remifer*. Plumage nowhere distinctly hackled, but a tendency to this on the sides of the neck; and the clothing feathers are soft and somewhat loose in texture, their glossed tips imparting a spotted appearance to the neck, and a uniform shine on the back, the brilliancy increasing on the wings: tarsi  $\frac{7}{8}$  inch. This species is nearly allied to the racket-tailed group, though wanting that particular character.

12. *E. annectans*: *Dicrurus* (olim *Buchanga*) *annectans*, Hodgson, *Ind. Rev.* 1837, 326. There are two specimens of a Drongo in the Darjeeling collection, the smaller of which agrees very well with Mr. Hodgson's description above cited, but the larger (and they are very obviously identical) measures 12½ inches to end of outermost tail-feather, the wing 5½ inches, bill to forehead nearly 1 inch, and above  $1\frac{1}{8}$  inch to gape, tarse  $\frac{3}{4}$  inch, and hind toe and claw  $1\frac{1}{16}$  inch in a straight line. The bill, as compared with that of the common *E. balicassius* (seu *albirictus*, Hodgson), is longer, considerably less Shrike-like, not so compressed at the terminal half, the ridge is much more angular, the point less hooked, the feathers impending its base are shorter, and less distinct from those of the forehead; the gloss of the plumage has less of a

greenish cast, but more of a greyish-blue, and is not very bright; and the under-parts especially are duller, the throat and belly being dusky and having scarcely any or indeed no gloss. The smaller specimen measures but  $10\frac{1}{2}$  inches long, the wing  $5\frac{1}{4}$  inches, outermost tail-feather  $5\frac{1}{4}$ , the medial (which are both imperfect in the other)  $4\frac{3}{4}$  inches: the twirl of the outermost tail-feathers is less than in *E. balicassius*.

I have also a species from the Malay peninsula, which is even intermediate to the last and *D. balicassius*, but has the tail much less forked than in either, and in this respect and also in its plumage approximates to my presumed *C. viridescens*. Bill much as in the latter, but widening somewhat more to the base, its upper ridge more elevated than in *annectans*, and the moderately hooked tip of the upper mandible intermediate to those of *annectans* and *balicassius*, and nearly resembling that of *viridescens*. Length of three specimens  $9\frac{1}{2}$  to  $10\frac{1}{2}$  inches, of wing from bend  $5\frac{1}{4}$  to  $5\frac{1}{2}$  inches, outermost tail-feathers  $4\frac{1}{2}$  to 5 inches, medial  $4\frac{1}{2}$  to  $4\frac{5}{8}$  inches; bill to forehead  $4\frac{1}{8}$ , and to gape  $1\frac{1}{4}$  inch, its vertical depth at base exceeding  $\frac{3}{8}$  inch; tarse  $\frac{3}{4}$  inch: frontal plumes not lengthened, but erect and reversed anteriorly, though to a much less extent than in *viridescens*; outer tail-feathers curling just perceptibly upwards at the tip. The plumage of this species very closely resembles that of *E. balicassius*, but inclines a little to assume the character of that of *E. viridescens*; the tail in the latter being all but square, while in the present it is very distinctly though slightly forked, and the much more angular ridge of the bill will always serve to distinguish it readily from *E. balicassius*. As out of the host of *half descriptions* in Latin, French, and English, to which I have access, there is not one that applies satisfactorily to this unquestionable species, I must sever the Gordian tie by styling it *E. affinis*.\*

\* Recurring now to Mr. Hodgson's paper on the Drongos repeatedly referred to, it may be as well to recapitulate the conclusions at which I have arrived, concerning the species which are there described.

The *Cometes* (olim *Chibia*) *casia*, yields precedence to *Edolus Cristina*, Gould, and has long previously been figured and described by Latham as the *Cristina Crow*.

The *Cometes* (olim *Chibia*) *Malabaroides*, H. is the *Lanius Malabaricus* as described by Shaw and figured by Latham and Stephens, but not the *Malabar Shrike* or *Drongo* of Sonnerat and Buffon, nor that recently styled *Malabaricus* by Gould and others: it is the *E. grandis*, Gould.

The *Melisseus* (olim *Bhringa*) *tectirostris*, H. would seem to have been previously undescribed, and must be very closely allied to *E. remifer*.

13. *Pomatorhinus ruficollis*, Hodgson, *As. Res.* XIX, 182 ; where also are described *P. schisticeps*, H., which is clearly the same as, and takes precedence of, *P. leucogaster*, Gould (*P. Z. S.* 1837, 137) ; and *P. erythrogenys*, Vigors (*P. Z. S.* 1831, 173, and figured in Gould's Century, Plate LV). A fourth Indian species is the *P. Horsfieldi*, Sykes (*P. Z. S.* 1832, 89) ; and a fifth the *P. montana*, Horsf. (*Lin. Trans.* XIII, 165, and figured in the 'Zoological Researches in Java'), which was obtained by Dr. McClelland in Assam (vide *P. Z. S.* 1839, 166). Others inhabit Australia, as the *P. turdinus* and *P. trivirgatus* of Temminck (the latter having been figured in Messrs. Jardine and Selby's 'Illustrations of Ornithology,' Plate LXIX) ; and a third has been characterized by Mr. Gould from the north-western coast of that country, as *P. rubecula* (*P. Z. S.* 1839, 144). It is probable that still other species have been added, with which I am unacquainted ; the genus having been originally constituted upon one only, which encourages me to distinguish and designate the following :—

*Xiphirhynchus*, Nobis : allied to *Pomatorhinus*, but the bill much longer and more slender, very thinly compressed throughout its length, widening only at the extreme base, and describing a considerable incurvation. Plumage, wings, and tail, as in *Pomatorhinus*, but the toes and claws rather more slender and elongated.

The *Dicrurus* (olim *Buchanga*) *albirictus*, H., is clearly *E. balicassius*, which would appear to be very common throughout India ; Mr. Hodgson has figured it in the 16th volume of the Asiatic Researches.

The *D.* (olim *B.*) *annectans*, H., does not appear to tally with any previous description with which I am acquainted.

The *Chaptia muscipetoides*, H., is identified by Mr. Jerdon with *E. æneus*, or *Dicrurus æneus*, Vieillot.

Mr. Jerdon, in his list of birds inhabiting the Indian Peninsula (*Madr. Jour.*, No. XXXV., 238, *et seq.*), includes five species of this genus, viz. *balicassius*, *cærulescens*, Vieillot (v. *Pingal*, Shaw, v. *leucogaster*), doubtful *macrocerus*, Vieillot, *æneus* (v. *muscipetoides*, Hodgson), and supposed *retifer*. Major Franklin's list (*P. Z. S.*, 1831, 117,) contains only *cærulescens* ; and that of Col. Sykes (*P. Z. S.*, 1832, 86,) but *cærulescens* and *balicassius*. Dr. McClelland's collection from Assam comprised *grandis*, *Rangoonensis*, *balicassius*, and *æneus* : and finally, I may notice that three species are mentioned in Dr. Horsfield's catalogue of the birds of Java (*Lin. Trans.*, XIII, 145), viz. *forficatus* (? this is an African bird), *cineraceus* (there described), and alleged *Malabaricus*.

A monograph of this genus, with full and adequate descriptions of every species known up to this time, would be highly acceptable to ornithologists. Various other insufficient notices of oriental species exist, of which several may refer to some of the foregoing.

14. *X. superciliaris*, Nobis : size of a Shahmour (*Copsychus macrourus*), and slightly rufous brown, with dull ferruginous under-parts, a dark ash-coloured head, and narrow white streak over the eyes. Length of a male  $8\frac{1}{2}$  inches, and of a female  $8\frac{1}{2}$  inches ; of wing, from bend  $2\frac{1}{2}$  and  $2\frac{1}{2}$  inches, and tail  $3\frac{1}{2}$  and  $3\frac{1}{2}$  inches : bill to forehead 2 inches over the curve, and  $1\frac{1}{2}$  inch in a straight line, the upper mandible a little exceeding the lower one in length : tarse 1 inch, middle toe and claw  $1\frac{3}{16}$  inch, and hind toe and claw 1 inch, the latter nearly  $1\frac{1}{2}$  inch. Colour of the upper-parts uniform brown, the quills and tail dusky ; of the under-parts dull or but moderately bright rufo-ferruginous ; crown, occiput, and sides of the head, dark cinereous, having a narrow superciliary white line continued backward to the occiput : throat whitish, streaked with dusky grey ; and breast fainter rufous than the belly, and obscurely spotted with dusky : shoulders of the wings and tibial feathers dark cinereous : bill dusky-black, with whitish tips to the mandibles ; and legs apparently leaden-brown, perhaps tinged with greenish. The female only differs in having the rufous colouring of the under-parts not so bright. Inhabits Darjeeling, and is reported to be a pleasing songster.

The two last genera pertain to a vast natural group, mostly characterized by soft puffy plumage and its usual concomitants—rounded wings and a graduated tail, strong feet and claws (remedying the deficiency of the volar powers), in general a particular style of marking, and the bill assuming almost every modification of form, whence, from the undue consideration with which this organ has been customarily regarded, the various genera have been scattered about in systems according to the resemblances borne by it to the exclusion of everything else. These birds hop with the belly near the ground, taking moderately long springs, their action resembling that of a true Tree-creeper (*Certhia*) upon a horizontal surface : the greater number are gregarious in parties of eight or ten, chiefly but not wholly insectivorous, seeking their food much among fallen leaves as well as upon trees, and in general they have loud, harsh, and clamorous voices ; their flight is short and feeble, and they sail with motionless expanded wings as far as they can before alighting. Many have the bill laterally very much compressed, as exemplified by the two genera last noticed, (but especially *Xiphirynchus*,) in which it is more or less prolonged and curved downward ; the same

tendency to curve, with strong lateral compression, is retained in the much shorter bill of *Timalia* (in the species of which considerable diversity in the form of this organ is observable, as seen by comparing *T. pileata* with *T. Horsfieldi*); and the brevity and vertical depth attain their ultimum in *Paradoxornis*, Gould, (*v. Temnoria*, olim *Suthora*, Hodgson, and *Bathyrynchus*, McClelland,) where also there is considerable lateral compression. Other genera assume the meruline and warbler form of bill, as *Prinia*, various species of which differ in no other respect from *Timalia*, and even *Orthotomus*, where the diminution of size, and delicacy of general conformation are carried to the extreme. *Crateropus* (*v. Ianthocincla*, Gould), *Cinclosoma*, and their immediate allies, vary from the meruline form of bill, passing from that of *Pomatorhinus* into a corvine, as exhibited by *Keropia* (the *Garrulus striatus* of Vigors): and a meliphagidous modification occurs in *Alcopus* (olim *Sibia*), Hodgson, which in other respects borders closely upon *Crateropus*, while it leads off to the tribe of *Leiothrix*, *Heterornis* (olim *Cutia*), Hodgson, *Pteruthius* (with a Shrike-like bill), and others in every sort of way annectant, which it would be tedious to enumerate further. A second example of one of the most remarkable forms, I proceed to characterize as—

*Paradoxornis ruficeps*, Nobis. A rigid divider might, indeed, constitute of this a separate division, ranging intermediate to *Paradoxornis* and *Conostoma*, Hodgson (*ante*, X. p. 856); but without having a specimen of *Paradoxornis* to compare it with, I shall provisionally refer it to that genus. Length 7 in., of wing from bend  $3\frac{1}{2}$ , and middle tail feathers  $3\frac{1}{2}$  in., the two next on either side somewhat longer, the rest graduating, and the outermost  $\frac{1}{2}$  in. shorter than the longest: 6th and 7th quills subequal and longest, 5th a mere trifle shorter: bill to forehead  $\frac{9}{16}$  inch in a straight line, and above  $\frac{1}{2}$  inch in greatest vertical depth, the ridge of the upper mandible describing a considerable curve, and rising somewhat from its base, while the point a little overhangs that of the lower mandible; the sides are compressed, the section of the upper ridge is rounded, and the general form denotes a high degree of compressive power; nostrils round, lateral, and basal, and concealed by semi-reflected feathers directed upwards: tarsi strong, somewhat exceeding 1 inch in length, and furnished with stout claws suited for perching. General colour olive-brown, darker and tinged with rufous on the wings; white underneath, a little sullied on the flanks and sides of the abdo-

men; and head, cheeks, ear-coverts, nape and sides of the neck, bright rufous: wings underneath partly edged with pale rufous: the upper mandible chiefly horny brown, and the lower pale yellowish; a few small black vibrissæ at the rictus, and legs and feet pale. Described from two specimens received from Bootan.

16. *Keropia striata*, G. Gray; *Garrulus striatus*, Vigors, *P. Z. S.*, 1831, 7, and figured in Gould's *Century*, pl. XXXVII. I quite agree with Mr. G. Gray with respect to the propriety of arranging this bird among the *Crateropodinae* of Swainson, and would also locate the genus *Kitta* as another pseudo-corvine member of the same extensive natural assemblage.

17. *Crateropus Nipalensis*; *Cinclosoma Nipalense*, Hodgson, *As. Res.* XIX. 146.

18. *Cr. chrysopterus*; *Ianthocincla chrysoptera*, Gould, *Proc. Zool. Soc.* 1835, 186.

In the "Natural History and Classification of Birds," ii. 234, Mr. Swainson has justly identified the *Ianthocincla*, Gould, (*Proc. Zool. Soc.* 1835, 47,) with his *Crateropus*, "published more than four years previously." Mr. G. Gray, however, in his "List of the genera of birds," (p. 27), has ranged *Ianthocincla* as a synonym of *Garrulus*, Lesson, and introduces *Crateropus* as a separate head; but most assuredly the *Cr. Reinwardii* of Swainson's 'Zoological Illustrations,' is a thorough *Ianthocincla*, apud Gould. Mr. Vigors referred the species described by him to his *Cinclosoma*, now properly restricted to the Australian form exemplified by *C. punctatum*, v. *Turdus punctatus* of Latham; and Mr. Hodgson has also described several species under the generic head *Cinclosoma*. The form is extensively represented on the Sub-Himalayan regions, both as respects species and individuals. Mr. Hodgson enumerates 14 species as inhabitants of Nepâl, of which 5 have been described by Mr. Vigors (in *Proc. Zool. Soc.* 1831, 55-6, and 171), and a sixth, the *Corvus leucolophus*, Lin., figured as *Garrulus leucolophus* in Gould's *Century*, was judiciously assigned by him to the same group. Since then Mr. Gould has described 5 other species (in *Proc. Zool. Soc.* 1835, pp. 48 and 186-7), which descriptions were unknown to Mr. Hodgson at the time he prepared his paper on the genus published in *As. Res.* XIX, 143 *et seq.* (bearing date of publication 1836), wherein 8 presumed new species are added to those of Vigors;

four of them, however, appearing to me to be identical with as many of Gould's. Lastly, in the catalogue of Dr. McClelland's Assam birds (*P. Z. S.*, 1839, 159-60), two more species are added, on the authority of Dr. Horsfield; and I now add two others, making 18 from the southern or Indian base of the Himalayan range.

The following amended list results from my analysis of the various descriptions referred to, while a study\* of the labours of foreign naturalists is still necessary to establish the nomenclature in all cases.

*Cr. leucolophus*; *Corvus leucolophus*, Lin., figured in Gould's *Century*, pl. XVIII. A variety, or perhaps a very closely allied species, is noticed in one of my Reports (*ante*, X, p. 924).

*Cr. albogularis*, Gould, *P. Z. S.*, 1835, 187; *Cinclosoma albigula*, Hodgson, *As. Res.*, XIX, 146. In both cases the near affinity to the preceding species is remarked.\*

*Cr. gularis*; *Ianthocincla gularis*, McClelland and Horsfield, *Proc. Zool. Soc.*, 1839, 159: allied to the last species.

*Cr. ocellatus*; *Cinclosoma ocellatum*, Vigors, *Proc. Zool. Soc.*, 1831, 55, and figured in Gould's *Century*, pl. XV.

*Cr. capistratus*; *Cincl. capistratum*, Vigors, *Proc. Zool. Soc.* 1831, 55.

*Cr. variagatus*; *Cincl. variegatum*, Vigors, *Proc. Zool. Soc.*, 1831, 55, and figured in Gould's *Century*, pl. XVI.

*Cr. lineatus*; *Cincl. lineatum*, Vigors, *Proc. Zool. Soc.*, 1831, 55.

*Cr. erythrocephalus*, *Cincl. erythrocephalum*, Vigors, *Proc. Zool. Soc.*, 1831, 171, and figured in Gould's *Century*, pl. XVII.

*Cr. squamatus*; *Ianthocincla squamata*, Gould, *Proc. Zool. Soc.*, 1835, 48; *Cincl. melanura* (?), Hodgson, *As. Res.*, XIX, 147.

*Cr. chrysopterus*; *I. chrysoptera*, Gould, *Proc. Zool. Soc.*, 1835, 48.

*Cr. rufogularis*; *I. rufogularis*, Gould, *Proc. Zool. Soc.*, 1835, 48; *Cincl. rufimenta*, Hodgson, *As. Res.*, XIX, 148.

*Cr. pectoralis*, Gould, *Proc. Zool. Soc.* 1835, 186., McClelland and Horsfield, *Ibid*, 1839, 160; *Cincl. grisauris*, Hodgson, *As. Res.*, XIX, 146.

*Cr. Nipalensis*; *Cincl. Nipalense*, Hodgson, *As. Res.* XIX, 145.

*Cr. monilegerus*; *Cincl. monilegera*, Hodgson, *As. Res.*, XIX, 147.

*Cr. cærulatus*; *Cincl. cærulatum*, Hodgson, *As. Res.*, XIX, 147.

\* At the time of writing this, I had not identified a specimen which I find that the Asiatic Society's Museum possesses of this species. It is considerably less allied to *Cr. leucolophus* than is my *Cr. leucogenys*.

*Cr. lunaris* ; *I. lunaris*, McClelland and Horsfield, *Proc. Zool. Soc.*, 1839, 160.

*Cr. puniceus*, Nobis : length 8 inches, of wing from bend  $3\frac{1}{4}$  inches, and middle tail-feathers 4 inches, the outermost  $2\frac{1}{4}$  inches ; bill to forehead  $\frac{5}{8}$  inch, and to gape  $\frac{7}{8}$  inch ; tarsi  $1\frac{1}{4}$  inch : streak through the eye, ear-coverts, sides of the neck, exterior margins of the primaries, and of the terminal portion of the secondaries and longest tertiaries, with the lower tail-coverts, glistening crimson : rest of the plumage a rich brown, rather paler beneath, and tinged with rufous on the wings ; the tail dusky above, each feather tipped with rufo-ferruginous, and the lateral ones more broadly ; beneath ruddy : feathers of the crown elongated, forming a lax crest as in various other species ; those on the sides of the crown margined laterally with black, forming a superciliary streak : secondaries black interiorly, and partly margined with light grey. Bill dusky, and legs apparently brown : locality uncertain.

*Cr. leucogenys*, Nobis. More nearly allied to *Cr. leucolophus* than is *Cr. albogularis*, but crestless, though the frontal feathers stand erect and rigid. Length  $10\frac{1}{4}$  inches, of wing  $4\frac{1}{4}$  inches, and middle tail feathers  $5\frac{1}{4}$  inches, the outermost 1 inch shorter ; bill to forehead 1 inch, and to gape  $1\frac{1}{8}$  inch ; tarsi  $1\frac{1}{4}$  inch. Crown, occiput, neck, and under-parts, dark ash-colour ; the forehead, lores, orbital region, streak from the eye backward, feathers at the base of the lower mandible, and the throat and fore-neck, black, as likewise the tip of the tail ; ear-coverts white, and a little of this posterior to the black on the forehead : rest of the upper parts, with the thighs, vent, and lower tail-coverts, passing forward on the flanks, dark greenish olive-brown : primaries edged with greyish, and slightly albescent tips to the under surface of the outer tail feathers : bill dusky, and legs apparently greenish yellow. From Upper Bengal.

Besides these 18 species, two others have been described by Mr. Jerdon from the Neilghierries, as *Cr. cachinnans* (*Madr. Jl.*, No. XXV, 255, and there figured), and *Cr. Delleserti* (*Ibid*, 256) ; but I am unaware of any having been observed on the Malabar range, nor is any species noticed in Mr. Eyton's catalogue of a large collection of bird-skins from the Malay peninsula (*P. Z. S.*, 1839, 101, et seq.) ; neither among the *Turdi* (comprising various modern genera) of Dr. Horsfield's list of Javanese birds (*Lin. Trans.*, XIII, 147, et seq.), and the



Sumatran species referred to *Turdus* by Sir Stamford Raffles (ibid, 309 et seq.), does there seem to be one appertaining to this genus. The *Cr. Reinwardti*, again, figured in Swainson's Illustrations, and which was formerly understood to have been received from some part of the Indian archipelago, has since proved to be an inhabitant of Western Africa, as noticed with three other species from that locality in the 7th Ornithological volume of the Naturalist's Library. Nevertheless, it can hardly be supposed but that many species inhabit the interior upland districts of the regions adverted to.\*

*Cinclidium*, Nobis. The genus *Cinclidia*, Gould (*P. Z. S.*, 1837, 236), being identical with *Pellornium* of Swainson, I transfer the former name (with a slight alteration) to a nearly allied form, characterized as follows. Bill shorter than the head, straight, slender, higher than broad, the ridge of the upper mandible tolerably acute, and its tip very slightly emarginated; inferior gonys ascending for the terminal half, imparting to the bill the appearance of a tendency to bend upward: nasal apertures an elongate-oval fissure in the lateral nasal membrane, and partially impended by the short semi-reflected frontal feathers: gape armed with a few small setæ. Wings and tail rounded, the 4th, 5th, and 6th primaries equal and longest. Legs and toes slender, the tarsi smooth and unscutellate, and very long, as is also the middle toe; claws but moderately curved, and of little more than mean length. Plumage light, soft, and full, having a scale-like appearance on the crown, breast, and belly.

19. *C. frontale*, Nobis. Length  $7\frac{1}{2}$  inches, of wing from bend  $3\frac{1}{2}$  inches, and middle tail feathers  $3\frac{1}{2}$  inches, the outermost  $\frac{1}{2}$  inch shorter; bill to forehead nearly  $\frac{1}{2}$  inch, and to gape  $\frac{13}{16}$  inch; tarse  $1\frac{3}{8}$  inch; middle toe and claw  $1\frac{3}{16}$  inch, and hind toe and claw  $\frac{1}{2}$  inch, the last  $\frac{3}{8}$  inch. Plumage dark fusco-cyaneous, the rump dusky; flanks somewhat ashy, and middle of the belly slightly grey-edged; lores and immediately above the beak blackish, contrasting with a bright coerulean forehead; bend of the wing also coerulean, but less bright; and winglet, primaries and their coverts, secondaries and tertiaries, dark olive-brown; a white spot on the under surface of the wing, beneath the winglet: bill black, and legs dusky-brown. Darjeeling.

\* My supposed variety of *Cr. leucolophus* (*J. A. S.*, X. 924,) was received from Tenasserim.

20. *Tesia* (subsequently *Anura*) *cyaniventris*, Hodgson, *J. A. S.*, 1837, 101; 'genus *Micrura* of Gould, the bird having a very distinct small tail. *Aipenumia*? Swainson,

21. *Alcopus* (olim *Sibia*) *nigriceps*, Hodgson, *J. A. S.*, 1839, 38. A specimen in nestling plumage only differs in the comparative shortness and flimsy texture of its clothing feathers, and the diminished brightness of their colouring.

22. *Prosorinia* (olim *Cochoa*) *purpurea*? Hodgson, *J. A. S.*, V, 359; n. s.? *Hodgsonii*? Nobis. This nearly agrees with Mr. Hodgson's description, but would appear to be smaller, with the wing-speculum not white, but of the same hue as the crown: the specimen is marked male. I annex a description: length 10 inches, of wing  $5\frac{1}{2}$  inch, and tail  $4\frac{1}{2}$  inches; bill to forehead  $\frac{3}{4}$  inch, and to gape  $1\frac{5}{16}$  inch; tarsæ  $1\frac{1}{8}$  inch, middle toe and claw  $1\frac{5}{16}$  inch, and hind toe and claw above  $\frac{3}{4}$  inch. General hue slightly purpurescent-fuscous, the tail cyaneous-grey tipped with black, and wings mottled with darker cyaneous, pale blue-grey, and deep black: forehead, crown, and occiput, pale blue-grey, the feathers here being lengthened and somewhat loosely webbed, and laterally impending a broad black superciliary streak continued backward to the occiput; lores and ear-coverts also deep black, and the whole of the under-parts uniform fuscous: outer webs of the primaries (save the first one) pale blue-grey near the base, contrasting with the winglet which is black, as is also the remainder of the primaries; secondaries and tertiaries dark cyaneous, the former broadly tipped with black to an oblique line even with the longest tertiary; there is some pale grey also on the border of the wing anterior to the winglet, and the quills and tail are wholly black underneath. Bill black, and legs dusky. Darjeeling.

This genus, originally classed by Mr. Hodgson among the Thrushes, has since been regarded by him as Ampelidous, and intermediate to *Ampelis* and *Casmarkhynchus*. It appears to me to bear some relationship to the *Leiotrichinæ*. The *Ampelidæ* possess at least one distinct oriental representative in *Calypomena*, and an alleged Himalayan *Pipra* has been described by Mr. Burton (*P. Z. S.*, 1836, 113). The *Cra-taionyx* of Eyton (ibid, 1839, 104,) agrees with the two last genera in having syndactyle toes, and is perhaps also referrible to the same family; wherein the northern form *Bombycilla* has been generally

located. But the whole vast series of *Insessores* stands exceedingly in need of thorough revision by a naturalist of sufficient penetration to distinguish between mere superficial modifications bearing reference to habit, and the more immediate subtypes of form upon which such varied modifications are especially based.

23. *Heterornis* (olim *Cutia*) *Nipalensis*, Hodgson, *Journ. As. Soc.* 1836, 771. A singular form, not without some distant affinity to the last, but nearly related to nought with which I am acquainted.

24. *Pteruthius erythropterus*, Swainson; *Lanius erythropterus*, Vigors, *Proc. Zool. Soc.* 1831, 22, and figured in Gould's *Century*, Pl. XI. Female, differing from the figure in Gould's work by having the back and scapularies more tinged with cinereous, and the purer ash-grey of the head continued to beyond the occiput, and including the ear-coverts. A young male differs in the looser texture of its clothing feathers, in having the head and ear-coverts concolorous with the back, and the same defined white streak commencing above the eye as in the mature male; this being wanting, or only the merest trace existing of it, in the female.

25. *Pt. rufiventer*, Nobis, n. s. ? Female allied to the preceding species, but differing in the disposition of its colours, in having a longer and more graduated tail, and in its beak being somewhat longer and more compressed, with the terminal hook of the upper mandible rather less developed. Length  $7\frac{1}{2}$  inches, of wing from bend barely  $3\frac{1}{2}$  inches, and middle tail feathers  $3\frac{1}{2}$  inches, the outermost  $1\frac{1}{2}$  inch shorter; bill  $\frac{1}{2}$  inch to forehead, and 1 inch to gape; tarse  $1\frac{1}{2}$  inch. Back and scapularies vivid olive-green, a little mingled with black, which may be the predominant colour of these parts in the male: forehead, lores, super-orbital region, sides of the head, ear-coverts, throat, and breast, ash-grey, passing into deep black on the crown, which colour is continued over the occiput and nape: rest of the under-parts dull ferruginous, with an ill-defined broad zone of saffron across the lower part of the breast, bordering the grey: upper tail-coverts, and tips of the secondaries and of the longest tertiary, together with those of all the tail-feathers, deep ferruginous: wings principally green externally, the winglet and primary-coverts black, and all but the two outermost primaries more or less edged with whitish-grey, towards the tip only in the more inward, the rest of the edging being green: internally all the

wing-feathers are black, the secondaries narrowly edged, and the tertiaries broadly, with green; the under-surface of the wings is fulvescent-white where pure white in *Pt. erythropterus*: uropygials green with black shafts; the next pair of tail-feathers having a green outer-margin increasing in breadth towards the base, and the rest of the tail wholly black, excepting the rufous tips before noticed: the three outermost rectrices successively graduate in length, while the others are subequal. Bill black, and legs apparently light brown.

26. *Leiothrix calipyga*: *Calipyga* (olim *Bahila*) *calipyga*, Hodgson, *Ind. Rev.* 1838, 88.

27. *L. cyanoptera*: *Hemiparus* (olim *Siva*) *cyanoptera*, Hodgson, *Ind. Rev.*, 1838, 88; *Leiothrix lepida*, McClelland and Horsfield, *P. Z. S.* 1839, 162.

28. *L. strigula*: *H. strigula*, Hodgson, *Ind. Rev.* 1838, 89.

The Asiatic Society's Museum contains examples of three species of this elegant group, viz. *cyanoptera*, *ignotincta* (*Proparus*—olim *Minla-ignotinctus*, Hodgson, *Ind. Rev.*, 1838, 32, seu *Leiothrix ornata*, McClelland and Horsfield, *P. Z. S.*, 1839, 162), and *Nipalensis* (*Hemiparus*—olim *Siva-Nipalensis*, Hodgson, *Ind. Rev.*, 1838, 89). The *L. signata*, McClelland and Horsfield, *P. Z. S.*, 1839, 162, is clearly distinct from any of those of Mr. Hodgson, who further describes *L.* (*Proparus*, olim *Minla*,) *castaniceps*, (*Philocalyx*, olim *Mesia*,) *argenteus*, and (*Hemiparus*, olim *Siva*,) *viridipictus*. I do not myself perceive the necessity of subgenerically dividing them, and much suspect that several will prove to have prior appellations. The *Polyodon* (olim *Yuhina*), Hodgson, *As. Res.* XIX, 165, to judge from the Society's specimens of *P. flavicollis* (referred with a note of doubt to this genus by Mr. Hodgson), would seem to be closely allied.

29. *Parus flavocristatus*, de Lafresnaye; *Mesange à huppe jaune*, Guerin, *Mag. Zool.*, Pl. LXXX, Janvier, 1837, apud Horsfield: *P. sultaneus*, Hodgson, *Ind. Rev.* April, 1837, p. 81.

30. *Tricophorus striatus*, Nobis. Female: the sexes, however, reported to be similar. Length  $8\frac{1}{4}$  inches, of wing  $4\frac{1}{2}$  inches, and tail 4 inches; bill to forehead  $\frac{5}{8}$  inch, and tarse under  $\frac{3}{4}$  inch. General colour olive-green, brightest on the wings and rump, the crown and back darker, with a tinge of cinereous on the latter, and the feathers of these parts having a narrow white mesial streak occupying their shafts: occipital plumes elongated,

but having no hair-like stems intermixed : chin, a streak from the nostril to near the eye, the fore-part of the wings underneath, and the lower tail-coverts, bright yellow ; a tinge of the same on the throat, fore-neck, and belly, the feathers of the fore-neck being each tipped with a black spot : breast and ear-coverts whitish, tipped and laterally margined with greyish-black, the tips becoming obsolete on the belly : tail dusky, having its exterior webs greenish to near the end, and tinged with yellow underneath ; the two outermost rectrices, and the third to a less extent, tipped chiefly on the inner vane with yellowish white. Bill blackish, and legs dusky-brown.

This species would seem to be allied to *Tr. flaveolus*, Gould (*P. Z. S.* 1836, 6), which is also from the Himalaya, and was met with by Dr. McClelland in Assam. "*Tr. cristatus, supra olivaceo-flavescens ; genis guttureque sordide albis. Long. tot, 8 unc ; rostri, 6 ; ala, 4 ; cauda, 3½ ; tarsi, ¾ ; Rostrum pedesque corneo-brunnei.* The crest," it is added, "consists of elongated feathers, intermingled with the hairy bristles usual in the genus." The same species is thus described by Dr. McClelland. "Length 8 inches. Colour yellowish-green above, with a tinge of brown on the wings and tail, beneath bright yellow : crested with narrow feathers, becoming progressively longer from the nostrils to the crown : bill strong, compressed, and slightly hooked ; cheeks and nape scantily covered with feathers." (*P. Z. S.* 1839, 158).

Mr. Jerdon adds to the Indian species of this genus a bird which he conceives to be the *Turdus Indicus* of the old authors, and which he briefly describes as follows, by the appellation of *Tr. Indicus*, remarking that the *Tr. flaveolus*, Gould, appears to differ only in being crested. "Length 7½ to 8 inches, wing 4 inches, tail 3½ inches, tarsus rather more than  $\frac{7}{10}$ ths. Above olive green ; eye-streak (extending to the forehead), and beneath, yellow ; bill and legs black ; irides blood-red. This bird frequents only thick and lofty jungle on the West Coast, being found occasionally as high as 5000 feet. It lives in small flocks, flying from tree to tree, and keeping up a continual and pleasing Bulbul-like warble. In all the specimens I have examined, I have found fruit only in its stomach ; but from the strong bristles at the base of the bill, I suppose it may, at certain seasons, partake of insects. The same gentleman assigns to this genus, at least provisionally, the *Ixos virescens*, Tem., and a typical species exists in the Javanese *Turdus gularis*, Hors-

field, described as follows: *T. fuscescente olivaceus alis caudæque ferrugineis, gula alba, abdomine flavo. Remiges internè fusca; vertex griseo ferrugineus; axillæ flavescentes. Longitudo 7 poll.*" (*Lin. Trans.* xiii, 150). To these may be added *Tr. crispiceps*, nobis, described in my Report for February as an inhabitant of Tenasserim and the Malay Peninsula.

31. *Pycnonotus* (Kuhl; *Brachypus*,\* Swainson;) *melanocephalus*, Hardwicke and Gray: *Vanga flaviventris*, Tickell, *J. A. S.* II. 573.

32. *Hypsipetes psaroides*, Vigors, *P. Z. S.* 1831, 43, and figured in Gould's *Century*, pl. x. A very closely allied species to this has recently been discovered on the Neilgheirries, the *H. Neilgheiriensis*, Jerdon, *Madr. Jour.* No. xxv, 245, and there is another in the Indian Peninsula, the *H. Ganeesa*, Sykes, *P. Z. S.* 1832, 86, and figured in Jardine and Selby's *Illustrations of Ornithology*, pl. cxlvii. Two more are described in the list of Dr. McClelland's birds procured in Assam, as *H. McClellandii*, Horsf., and *H. gracilis*, *P. Z. S.* 1839, 159.

33. *Chloropsis Hardwickii*; Jardine and Selby, *Ill. Orn.* ii, Appendix; *Chl. cyanopterus*, Hodgson; *Chl. chrysogaster*, McClelland and Horsfield, *P. Z. S.* 1839, 167.—Vide my Report for January.

*Heterophasia*, Nobis, n. g? A curious Meruline form, exhibiting affinity for various distinct genera, but which cannot be immediately approximated to any with which I am acquainted. It has long rounded wings, a very long and much graduated tail, slender and slightly curving bill, and rather short tarsi. Bill longer than the head, slender, tapering, a little incurved, its base as high as broad, and gradually more compressed for the basal  $\frac{3}{4}$ ths; the ridge of the upper mandible distinct (but not sharp) to beyond the nostrils, then rather less so, and its tip very slightly if at all emarginated: nostrils somewhat large, and almost closed by impending membrane, the nasal orifices appearing as mere fissures on the inferior margin of this, though more apart anteriorly: a few small setæ at the gape. Tarse somewhat longer than the middle toe; and the claws compressed and suited for perching. Wings having the 5th or 6th primary longest, and the 7th equal to the 4th. Tail broad and very much lengthened and graduated. The plumage throughout is soft, dense, and smooth; the wings and tail tolerably firm.

\* "Previously employed in other branches of Natural History."—G. Gray.

34. *H. cuculopsis*, Nobis. Length  $12\frac{1}{2}$  to 13 inches, of wing from bend  $4\frac{1}{2}$  inches, and middle tail-feathers  $7\frac{1}{2}$  to 8 inches, the outermost  $4\frac{1}{2}$  inches shorter, and all the rest graduating; bill to forehead  $\frac{7}{8}$  inch, and to gape  $1\frac{1}{8}$  inch; tarse 1 inch. General colour greyish-fuscous on the upper parts, beneath dark ashy, becoming paler on the belly; medial third of the outer webs of four of the secondaries white, forming a moderately large wing-spot; the rest of the wing, and the tail feathers, dusky, all the latter having broad whitish-grey tips: forehead and lores black. Bill and feet blackish. Some (females?) have a brownish cast of general colouring, which is not observable in others. At a first glance, this bird is apt to be mistaken for *Cuculidous*; an appearance to which its large and lengthened graduated tail, each feather tipped with whitish, its incurved bill, and the general hue of its colouring, alike contribute. From Darjeeling.

35. *Accentor Himalayanus*? Allied to *A. Alpinus*, but little larger than *A. modularis*. Length 6 inches, wing  $3\frac{1}{2}$  to  $3\frac{3}{4}$  inches, tail  $2\frac{1}{4}$  inches, bill to forehead  $\frac{1}{2}$  inch, and tarse nearly  $\frac{7}{8}$  inch; scapularies and interscapularies rufous-brown, mottled with large black terminal spots on the middle of each feather, more or less developed in different specimens: forehead, crown, occiput, neck, shoulders of the wings, and rump, nearly uniform dingy grey-brown, with an inconspicuous lighter greyish eye-streak; throat and fore-neck white, with small round black spots disposed as in *A. Alpinus*; ear-coverts streaked with fulvescent, and small loreal and infra-orbital feathers tipped with fulvous-white; gorget brown, more or less tinged with rufous, which latter brightens on the lower breast, flanks, and sides of the belly, the feathers being laterally edged with white, and some having dark streaks on the flanks posteriorly: lower tail-coverts white, with lanceolate central dusky spots: wings intricately mottled, having the anterior range of coverts dusky-black with white tips, the next or great range fulvescent-grey exteriorly at base, and dusky-black for the remainder with slight whitish tips: primaries edged with grey, secondaries with brown, and tertiaries with fulvous: tail dusky, having a large white spot at the tip of the outer web of each feather. Bill black, and legs reddish brown. This is a typical *Accentor*, and the first which to my knowledge has been obtained on the Himalaya range, though *A. Alpinus* is included in M. Temminck's list of European birds inhabiting Japan. *A. modularis* has been killed near Smyrna in winter (*P. Z. S.*, 1836, 98), where stated to be

rare. Referring to Mr. Yarrell's work on British birds, I perceive it remarked that a species of this genus has been received from the Himalaya, which is probably that here described.

36. *Pitta nuchalis*? Nobis, n. s.? Length  $9\frac{1}{2}$  inches, of wing  $4\frac{1}{2}$  inches, tail  $2\frac{1}{2}$  inches, bill to forehead  $1\frac{1}{2}$  inch, and to gape  $1\frac{1}{2}$  inch, its vertical depth at base above  $\frac{1}{2}$  inch, and tarse 2 inches. Above shining dingy green, passing into fulvescent-brown on the scapularies and wings; the back of the neck verditer-blue; and the occiput above it greenish: crown, sides of the head, and under-parts, dull rufous-brown, paler on the forehead and throat; bill robust, and carneau-tinged with dusky; the legs apparently pale carneau. Specimen marked male.

37. *Turdus* (*Oreocincla*, Gould,) *Whitei*, Eyton.

38. *T. mollissimus*, Nobis. Equally allied to *T. Whitei* and the European *T. musicus*, this handsome species can hardly be placed in a subdivision typified by either of these apart from the other, though I think it approaches nearest to *T. musicus*. It is, however, considerably larger, a female measuring  $9\frac{1}{2}$  inches long, the wing from bend  $5\frac{1}{2}$  inches, and tail 4 inches. Bill shaped as in the Mavis Thrush (*T. musicus*), and  $\frac{15}{16}$  inch to forehead, to gape  $1\frac{1}{2}$  inch; tarse  $1\frac{1}{2}$  inch: 3rd and 4th primaries equal and longest, the 5th a little shorter, the 2nd above  $\frac{1}{2}$  inch shorter than the 3rd, and the first diminutive. Plumage remarkably dense and soft in texture, having a smooth surface, and of a uniform rich brown colour above, with a slight cast of orange, being very nearly that of the back of an English Robin: wing-coverts and tertiaries slightly margined with paler, except the greater coverts of the primaries, which are tipped with blackish; the inner webs of the primaries are dusky, and their outer webs are emarginated as in *T. musicus*; the under-surface of the wing is marked with black and white, as in the *Oreocincla*: tail also displaying an affinity to the latter group, its four middle feathers being brown like the back, the outermost pair albescent-brown with a whitish tip, the two next having successively less white at the tip, and the remainder of the tail being blackish: under-parts clear fulvous, deepest on the breast, and becoming whitish along the centre of the belly; very richly spotted with deep black, and much more densely than in *T. Whitei*, the spots forming broad transverse crescents below the breast, and being of a triangular form upon the latter, the throat, and front of the neck: orbits, and a streak from the



bill to the eye, pale fulvous; but none of this passing over or beyond the eye. Bill dusky-yellowish at the base of the lower mandible, and legs light-brown. So far as I can remember the African *T. guttatus*, Vigors, (*P. Z. S.* 1831, 92,) it seems nearly allied to that species.

39. *T. Naumanni*, Temminck; which the Asiatic Society has also received from Nepal.

40. *T. (Merula) paciloptera*, Vigors, *P. Z. S.* 1831, 54, and figured in Gould's *Century*, Pl. xiv.

41. *T. (Petrocincla) erythrogaster*, Vigors, *P. Z. S.* 1831, 174, and figured in Gould's *Century*, Pl. xiii. The young has a large angular whitish spot upon each feather, which is further tipped with blackish; differing thus considerably from the adult female, as the latter does from the male.

42. *Chaitaris* (Hodgson, *J. A. S.* 1841, 29, olim *Niltava*, H., *Ind. Rev.*, 1837, 651,) *grandis*, Nobis. Length  $8\frac{1}{2}$  to  $8\frac{1}{2}$  inches, of the female 8 inches; of wing respectively  $4\frac{1}{2}$  and  $3\frac{7}{8}$  inches, and tail  $3\frac{7}{8}$  and  $3\frac{5}{8}$  inches; bill to forehead  $\frac{3}{4}$  inch, and to gape  $\frac{15}{16}$  inch; tarse  $\frac{7}{8}$  inch. Colour of the upper parts precisely as in *Ch. sundara*, Hodgson, except that the purple hue of the back is considerably brighter; or, to particularize, the crown, a large spot on each side of the neck, the shoulders of the wing, and the rump, are brilliant lazuline, and the rest of the upper-parts glossy dark purple: forehead, lores, cheeks, ear-coverts, throat and breast, deep black, without any purple gloss; the belly empurpled-black, (as much so as the back of *Ch. sundara*,) and passing into ashy on the vent and lower tail-coverts: under surface of the wings and tail black, as likewise the bill; and the legs dusky-black. The female entirely resembles that of *Ch. sundara*, except in its much larger size, and in having a rufous tinge on the under-parts generally, but especially on the throat, while the white gorget of *Ch. sundara* is totally absent. From Darjeeling, and I am informed that it also inhabits Tenasserim.

43. *Ch. sundara*, Hodgson. Two other species are described by that naturalist, viz. *Ch. McGregorii* (*Phænicura McGregorii*, Burton, *P. Z. S.* 1835, 152, *Ch. fuligiventer*, Hodgson), and *Ch. rubeculoides* (*Phænicura rubeculoides*, Vigors, *P. Z. S.* 1831, 35, and figured in Gould's *Century*, Pl. xxv. 1, seu *Ch. brevipes*, Hodgson).

*Dimorpha*, Hodgson, *J. A. S.*, 1841, 29, olim *Siphya*, H., *Ind. Rev.*

1839, 651. The following two species are evidently referrible to this division, which is allied to the preceding one, and borders closely upon *Cryptolopha* of Swainson.

44. *D. superciliaris*, Nobis. Length  $4\frac{1}{2}$  inch, of wing from bend  $2\frac{1}{2}$  inch, tail  $1\frac{3}{4}$  inch; bill to forehead  $\frac{7}{16}$  inch, and to gape  $\frac{9}{16}$  inch; tarse  $\frac{11}{16}$  inch. Colour of the upper-parts, chin, and sides of the neck, uniform dusky-cyaneous, the lateral feathers of the forehead white-tipped, passing as a streak over but not beyond the eye; bases of the primaries and secondaries rufous-brown exteriorly, contrasting with the hue of their coverts; throat and breast light ferruginous, paling on the belly, and passing into white on the vent and lower tail-coverts. Bill black, and legs very slender and apparently dusky-plumbeous. Fifth primary rather the longest. Specimen marked male.

45 *D. albogularis*, Nobis. Length  $4\frac{1}{2}$  inches; of wing  $2\frac{7}{16}$  inches, and tail  $1\frac{3}{4}$  inch; bill to forehead  $\frac{7}{16}$  inch, and to gape above  $\frac{9}{16}$  inch; tarse  $\frac{9}{16}$  inch. Colour of the upper-parts, sides of head and neck, and across the breast, uniform dark cyaneous, much brighter than in the preceding species; the throat, fore-neck, and under-parts below the breast, pure white: bill black, and legs dusky black. Third and fourth primaries sub-equal and longest.\*

46. *Phænicura frontalis*, Vigors, *P. Z. S.*, 1831, 172, and figured in Gould's *Century*, Pl. xxvi. 1; differing, however, somewhat in colouring from that figure, inasmuch as the head and neck, back and wings, are not black, but dusky-cyaneous, having terminal brown winter edgings, the forehead and above the eye being much brighter. The specimens of *Ph. atrata*, Jardine and Selby (*Ill. Orn.* Pl. lxxxvi), also, which I have seen, differ from that figure in wanting the bright rufous margining of the wing-feathers, which are edged with greyish, having but a slight rufous tinge on the border of the tertiaries only. The Museum of the Asiatic Society contains also the *Ph. fuliginosa*, Vigors, *P. Z. S.* 1831, 31, being evidently the same as has been since described by Mr. Gould as *Ph. plumbea*, *Ibid*, 1835, 185; likewise *Ph. leucocephala*, Vigors and Gould; and another Indian (and presumed Chinese) species, which I do not know, is the

\* The Asiatic Society has since received this species from Chyebassa, in Central India.

*Ph. Reevesii*, Gray, Zool. Misc., which was procured by Dr. McClelland in Assam : the *Ph. ceruleocephala*, Vigors and Gould, seems but doubtfully referrible to this group. In Western India, the European *Ph. albifrons* (or *rusticilla*) is met with, and very probably also, the *Ph. titlys*, though I am not aware for certain of the latter having been observed further to the eastward than on the bare rocky hills about Smyrna, where it is common ; the *Ph. albifrons* is included by M. Temminck among the birds of Japan.\*

47. *Phyllopnus reguloides*, Nobis. This species approaches very closely to the *Regulus modestus*, Gould ; but to judge from recollection of the original specimen of that rare bird, and also from the dimensions ascribed to the second specimen obtained (vide *An. Nat. Hist.*, ii, 310), which was in England, the former having been killed in Dalmatia, I conclude it to be different, and to be further removed from the genus *Regulus*, an undescribed crestless species of which is also before me. Length  $4\frac{3}{8}$  inches, of wing  $2\frac{1}{4}$  inches, and tail  $1\frac{3}{4}$  inch ; bill to forehead nearly  $\frac{1}{2}$  inch, and to gape  $\frac{9}{16}$  inch ; tarse  $\frac{11}{16}$  inch ; 4th and 5th quills equal and longest, the 3d and 6th a trifle shorter, and also equal. General colour of the upper parts yellowish olive-green, brightest on the wings, which have the inferior margin pure yellow anteriorly, and the tips of their greater and lesser coverts pale yellowish, forming two cross-bands ; under-parts albescent, streaked with yellow as in *Ph. trochilus* : sides of the crown ashy, mingled with olive-green, and passing into dusky on the sides of the occiput, being traversed by a conspicuous sulphur-yellow superciliary streak ; along the centre of the head the ashy tint is wanting, leaving a narrow greenish-yellow mesial line, best seen when the bird is held at a little distance. Bill, which is strictly that of the present group, and not of *Regulus*, dusky-brown above, the lower mandible yellow : feet delicate, and apparently light-brown tinged with plumbeous. The *Ph. rufa*, or British Chiffchaff, I may remark, is common in the neighbourhood of Calcutta during the cool season.

*Regulus inornatus*, Nobis. Length  $3\frac{7}{8}$  inches, of wing  $2\frac{1}{2}$  inches, and tail  $1\frac{3}{8}$  inch : bill to forehead  $\frac{3}{8}$  inch, and to gape nearly  $\frac{1}{2}$  inch ; tarse

\* *Ph. atrata* is common in the neighbourhood of Calcutta, and extends throughout the Indian peninsula, where two new species have lately been described by Mr. Jerdon, in his supplement, as *Ph. Major* and *Ph. superciliaris*.—E. B.

barely  $\frac{1}{4}$  inch. General colour and markings similar to those of *R. auricapillus*, excepting on the head, the black band at the base of the outer webs of the secondaries of that species also wanting, and the whitish tips of the tertiaries extending further up the outer margin of those feathers: crown wholly green like the back, with no trace of a mesial crest, nor even the lateral dusky lines seen in the nestling plumage of the crested species; but a pale superciliary streak, bordered underneath with dusky-greenish on the upper ear-coverts, the rest of these being pale yellowish. Bill typical in shape, but no single plume (as usual) impending the nostrils, any more than in *R. modestus*; its colour pale, especially at the base of the lower mandible, and legs apparently light brown. Locality of the specimen unknown, but I am told that this bird inhabits the vicinity of Darjeeling.

48. *Budytes citreola*, Auct.

49. *Oriolus Traillii*, Hodgson, *J. A. S.*, vi, 110; *Pastor Traillii*, Vigors, *Proc. Zool. Soc.*, 1831, 175; *Psarophilus Traillii*, Jardine and Selby. I entirely agree with Mr. Hodgson in considering this fine species to be a true Oriole.

50. *Pericrocotus* (Boie, *Acis*, Lesson, *Phænicornis*, Swainson,) *brevirostris*, Vigors and Gould. Both sexes, the female differing from Gould's figure, (which is now referred to *P. affinis*, McClelland, *P. Z. S.* 1839, 157,) by having the throat much brighter yellow, and more of this colour on the forehead to above the eyes; they are clearly enough identical in species with the crimson-breasted males in the same collection.\*

51. *Cinnyris Nipalensis*, Hodgson, *Ind. Rev.* 1837, 273.

52. *C. Gouldii*, Vigors, *P. Z. S.* 1831, 44, and correctly figured in Gould's *Century*, Pl. lvi.

53. *C. saturata*, Hodgson, *Ind. Rev.* 1837, 273; *C. Assamensis*, McClelland and Horsfield, *P. Z. S.* 1839, 167.

54. *C. rubricaudata*, Nobis. A very magnificent new species, described in a Monograph of the Oriental *Cinnyridæ* which I have lately drawn up.

55. *Linota saturata*, Nobis. A large species, belonging to the subdivision typified by *L. minor*. Length of a male 6 inches, of wing from bend

\* I cannot help suggesting that *Ph. affinis* is no other than the immature male of *brevirostris*, which may require more than one season to attain its livery of maturity.

$3\frac{1}{2}$  inches, and tail externally  $2\frac{1}{2}$  inches; bill to forehead above  $\frac{7}{16}$  inch, and tarse  $\frac{3}{4}$  inch; 2nd and 3rd primaries equal and longest, the 4th and 1st successively a trifle shorter. Summer aspect of plumage uniform dusky above, inclining to greyish on the shoulders and rump, and everywhere margined with dark claret-red; throat, and occipital stripe commencing at each eye, with the lower parts below the breast, fine dark roseate; crown and breast margined with deeper claret-red; tail a little forked, and dusky; wings dusky-brown, their coverts margined with dull-red, the tertiaries towards the end of their outer webs with ruddy-brown, and the primaries with pale brown: bill shaped as in a British Redpole, or nearly as in *Carduelis*, and dusky above, paler beneath; feet dark brown.

56. *L. fusca*, Nobis. Allied to *L. cannabina*, but the beak more lengthened and bulging laterally about the middle, wherein it differs from *L. saturata* and the other Redpoles. Length of a female  $5\frac{1}{2}$  inches, of wing  $3\frac{1}{2}$  inches, and tail externally  $2\frac{1}{2}$  inches, being a little furcate; bill to forehead  $\frac{1}{2}$  inch, and tarse  $\frac{5}{8}$  inch: 3 first primaries sub-equal, the 2nd somewhat the longest, and the 4th shorter than the first. Colour uniform dull ashy olive-brown, a little fainter below, and paled on the middle of the belly and tips of the under tail-coverts: the back having a very slight cast of orange, more developed on the rump and upper tail-coverts, where mingled with dull red; wings and tail dusky, more or less edged with orange brown: bill dusky above and at the tip, the lower mandible paler: feet pale brown.

I shall now conclude by describing three other species of birds which I suspect are new.

*Pica megaloptera*, Nobis. This is the fourth species of true black and white Magpie with which I am acquainted, and it is readily distinguished from the others by its larger size, and more particularly that of the wings, while the tail is proportionally less elongated, and by the absence of any grey band across the rump. Length 18 to 20 inches, of wing from bend  $9\frac{1}{4}$  to  $9\frac{3}{4}$  inches, and middle tail feathers 10 to  $10\frac{3}{4}$  inches; bill to commencement of frontal plumes  $1\frac{1}{2}$  to  $1\frac{5}{8}$  inch, and tarse 2 to  $2\frac{1}{4}$  inches. Plumage and markings exactly similar to those of the Common Magpie, except that the glosses are somewhat different (as I observed upon formerly comparing two specimens in the Asiatic Society's Museum with examples of the true British Magpie

brought by Dr. Cantor from Chusan) ; and the plumage of the rump is everywhere broadly black-tipped, through dull cinereous within. Inhabits Bootan.

*Ampeliceps*, Nobis. Allied to *Pastor*, but the bill more sharp-pointed and widening to its base, having the terminal third moderately compressed, and the ridge of the upper mandible obtusely angular ; nostrils large and impended by bristly feathers, and the gape unarmed. Tarsæ and toes much shorter and more robust than in *Pastor*, the former not exceeding in length the middle toe with its claw, and the claws also rather short, stout, and much curved. Wings reaching beyond the middle of the tail, having the first primary minute, the 2d and 3d nearly equal, the second being longest. Skin thick, and plumage rather firm and glossy.

*A. coronatus*, Nobis. Length 8 inches, of wing from bend  $5\frac{1}{2}$  inches, and tail  $2\frac{1}{2}$  inch ; bill to forehead  $\frac{3}{4}$  inch, and to gape 1 inch ; and tarse  $\frac{7}{8}$  inch. General colour black with a steel shine ; the forehead, lores, crown and occiput, chin and throat, together with a large wing-spot on the base of the outer webs of the primaries excepting the first one,—bright yellow ; the coronal feathers slender and rigid, and those of the sides of the forehead erect and curving over towards the mesial line, forming a frontal crest somewhat resembling that of *Pastor cristatellus* : inner webs of all the primaries yellowish-white at base, producing a large mark of this colour on the under surface of the wing. Bill dusky black, and legs apparently yellowish-brown. Tenasserim.

*Timizos*, Nobis. A puzzling form, as regards its exact position, combining the characters of many very different genera. The bill is quite *Parian*, or shorter than the head, strong, higher than broad, the ridge of the upper mandible obtuse, and its tip slightly emarginated ; both mandibles are nearly of equal length, having their outlines distinctly accurved : nasal orifices a round aperture in the fore-part of the nasal membrane : the gape feebly bristled. Tarsæ elongated and slender, the toes moderate, the outermost longer than the inner toe, and the claws compressed, that on the hind toe much the strongest and the most curved. Wings having the 4th and 5th primaries equal and longest, the 3d being a trifle shorter : tail even, and otherwise much resembling that of *Tricophorus*. The wings and tail are tolerably firm, but the rest of the plumage is excessively light, soft, and unsubstantial.

*T. meruloides*, Nobis. Length  $7\frac{1}{2}$  inches, of wing  $3\frac{7}{8}$  inches, and tail the same; bill to forehead  $\frac{9}{16}$  inch, and to gape  $\frac{13}{16}$  inch; tarse  $1\frac{1}{8}$  inch. General colour dull brown, paler underneath, and having a slight rusty tinge on the rump, flanks, and belly; throat and fore-neck whitish, indistinctly spotted with brown; tail slightly washed with yellow, as more conspicuously seen on its under surface; the greater wing-coverts, and tertiaries in part, rufous-edged, and a faint trace of yellowish on the margins of the primaries and secondaries. Bill dusky, and legs brown, neither light nor dark. Locality uncertain.

The two last, with the other new generic forms indicated in this paper, are all of very distinct character, insomuch that the propriety of their separation will hardly be disputed, though it may be that at least part of them bear prior appellations, and that some of my presumed new species have been described in works to which I have not access. This, however, is a chance to which all who venture on proposing a name must be liable, and I trust that if I have failed in identifying some species which are even tolerably well known, this will have been compensated by the number of synonyms which I have succeeded in reducing, while, at all events, until such pre-bestowed terms can be learned, those here applied will still be temporarily useful as substitutes, and I think I need hardly add that I have duly laboured in every instance in endeavouring to find a name, before venturing to coin those provisional ones which I have ultimately resolved upon proposing.

*Feb. 26th, 1842.*

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*Proceedings of the Asiatic Society.*

(Friday Evening, 4th February, 1842.)

The Honourable H. T. PRINSEP, Esq. President, in the Chair.

E. B. RYAN, Esq. proposed at the last Meeting, was ballotted for and duly elected a Member of the Society.

Ordered, that the usual communication of his election be made to Mr. RYAN, and that he be furnished with the rules of the Society for his guidance.

Sir E. RYAN and Dr. EWALD were also elected Honorary Members of the Society.

*Library.*

The following Books were presented:—

*List of Books received for the Meeting on the 4th February, 1842.*

	Fols.
Naturalist's Library.—Mammalia, vol. 11th, Marsupials, Edinburgh, 1841, ..	1
Transactions of the Agricultural and Horticultural Society of India, vol. 8th, ..	1
Annals and Magazine of Natural History, vol. 8th, No. 48, ..	1
Programme de la Société Royale D'Agriculture et de Commerce de Caen, ....	P
The Calcutta Christian Observer, new series, vol. 3rd, No. 26, Feb. 1842, ....	1
The Calcutta Monthly Journal, 3rd series, Nos. 83 & 84, October and November, 1842, ....	2

The Secretary presented a model of a Ceylon Boat, casts of Zodiacal Coins, also some casts of other miscellaneous Coins. A box of Coins collected in Kunnouj were likewise presented by Lieut. MCGREGOR, 66th Regt. N. I.

Read Letter from Mr. Secretary BUSHBY of 31st January 1842, with two small boxes, containing two specimens of Porcelain Clay, marked Nos. 1 and 2.

“The specimen, No. 1,” writes the Principal Collector of Canara, “was taken from a hill on the South bank of the Baloor river, a little to the North of Mangalore, and within a mile of the Sea. A small stream of water flows from the place whence it was taken, which appears to make it clear, and more free from particles of Late-rite than the other specimens. The clay taken from this spot is used as chunam for white-washing houses, and also by the Sepoys as pipe clay for cleaning their belts. The specimen No. 2, was taken from the face of a hill a short distance from the former spot.”



Read Letter from G. T. LUSHINGTON, Esq., Commissioner of Kemaon, of 25th January, 1842, advising the dispatch per dāk bangy, for presentation to the Society, of a doom, or brick of Tea, which was brought to Almorah from Tuklakote by the Ex-commandant of that place, by name Bustee Ram. Mr. LUSHINGTON writes, "The Tea is packed or pressed together in the usual manner, and I suspect there is Soda or Salt mixed in it; at least I find it rather brackish in taste. One of the merchants of this place, (Almorah,) who engages in the Bhote trade, tells me, that this doom is of the second quality, (Junjhoo,) and it is worth about six or seven rupees. The same informant has given me the following memorandum regarding price and quality of Teas brought down to Tuklakote by the Thibet traders, and there purchased by our Bhotias.

"1st Quality, Loodhan; value per doom, 12 rupees.

"2nd Quality, Junjhoo; value per doom, 6 to 7 rupees.

"3rd Quality, Chinjhoo; value per doom, 5 to 6 rupees.

"The doom weighs  $3\frac{1}{2}$  to 4 seers."

Read Letter from Lieut. S. R. TICKELL, of 19th January, 1842, advising departure of Gomes, the Taxidermist, who had left Chybassa, in consequence of having caught a fever, also forwarding a bill for Gomes's pay, &c. up to the 15th January, 1842, amounting to Co.'s Rs. 168: 1.

Lieut. TICKELL writes, "He (Gomes) takes with him a chest full of such birds, &c. as have been collected. I have sent a catalogue with it. I am now employing a Mussulman to preserve whatever I can pick up in my rambles. He gets now 5 Rs. a month, and has been promised more when he thoroughly knows his work; but in case of my not being successful in obtaining really valuable specimens, I shall not expect the Society to remunerate me for this expence, as it is a very trifling one."

Read observations on the genus *Spathium*, by M. P. EDGEMORTH, Esq., of the Bengal Civil Service, which will be published in the Journal.

Read Letter of 3rd February, 1842, from Mr. E. BLYTH, Curator of the Museum, recommending, as an able and experienced travelling Collector of Zoological specimens, who could aid him very materially in investigating the animal productions of this country, Mr. M. HOLQUETT, a former Assistant of Monsr. Duvaucel, who offers his services for a Salary of Rs. 50 per mensem, exclusive of travelling charges, which are to be paid to him separately.

The foregoing recommendation having been referred to the Committee of Papers, with the proposal of employing Mr. HOLQUETT experimentally on a Salary of Rs. 40

per mensem, with Rs. 10 per mensem additional, should his work give satisfaction, with a view to send him to Darjeeling to be under the orders of Dr. CAMPBELL and others; it was resolved to engage Mr. HOLQUETT, on the terms specified for six months, subject to special report at the end of that period.

The Honourable the President having audited the accounts for the past year (1841), laid before the Meeting of January, ordered that they be printed.

To H. TORRENS, Esq.

Secretary, Asiatic Society.

SIR,

In the latter part of the month of September 1840, you did me the kindness to confer upon me the appointment of Accountant to the Asiatic Society of Bengal, and the year 1841 having just expired, I do myself the honor to submit my Account Current, closed to the 31st Dec. 1841, exhibiting in favor of the Society, Co's. Rs. 19,516: 1: 9; viz.

In cash, .. ..	1,849	7	1	
In custody of the Govern- ment Agents in the 5 per cent. Loans, .. ..	17,666	10	8	Co's. Rs. 19,516 1 9
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I am not aware that it is necessary for me to enter into any detailed explanation as regards the accounts, but I may be permitted to draw attention to the following circumstances:—

1st. That the Society have become enriched during the last 15 months in its

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2d. That the debt of the Society to the Baptist Mission Press for printing has been paid off, Rs. 1,912: 3: 9.

3d. That the Secretary has been paid for supplying his Journals to Members and learned Societies in Europe, Rs 3,888.

4th. That for paper, and drawing and lithographing the specimens of Natural His-				
*1st 1,521 8 6	} tory by the late Sir A. Burnes, under preparation for publica-			
*2d 1,912 3 9				
3d 3,888 0 0				
4th 1,176 0 0				
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Co's. Rs. 8,497 12 3	making in the 4 items a total expenditure of Rs.			*8497 12 3

I have the honor to be,

Sir,

Your most obedient humble Servant,

W. H. BOLST.

CALCUTTA, 20th Jan. 1842.

The following contribution was presented by Mr. W. MASTERS, of the La Martiniere, for the Museum of the Society :—

A bottle containing a double child joined breast to breast, with four legs, four hands, one face, four ears, one on each side of the face, and two in close juxtaposition at the back of an apparently double head: the sex is male in each, and perfect: the limbs and features are natural, and without distortion. "This monster," writes Mr. MASTERS, "was the offspring of a Malabar woman, and born about five years ago in the vicinity of Madras; it died a few hours after its birth. After its birth people flocked from all quarters, under superstitious impressions, to present gifts to the mother."

The Curator read his Report for the past month, as follows :—

*Report for February.*

SIR,—During the short time that has intervened since our last meeting, specimens of the following Mammalia and Birds have been added to the Society's Museum.

MAMMALIA.

*Viverra Zibeth*, Horsfield, or *V. Indica* of M. Is. Geoffroy St. Hilaire, but not *V. Indica* of British authors; *Viverricula Rasse*, Hodgson. This, with its near ally, the *V. Indica* of British naturalists, are both common in this neighbourhood, and unquestionably distinct. I also know a third species, which I believe is from Northern India, and hitherto undescribed. For this and the next, the Society is indebted to the kindness of Dr. Wallich.

*Paradermus typus*, a remarkably fine old male, of a much deeper ground-colour than that noticed in my last report.

*Neomys Indica*: the female which was presented to the Society last month having died, it has been added to our collection of stuffed specimens.

*Ovis Naloor*, Hodgson. I have procured a handsome skin of this species, more deeply coloured than usual, and having the generic markings on the limbs, &c. very black and well defined.

AVES.

*Athene lugubris*; *Strix lugubris*, Tickell, J. A. S. I. 572. A common species in this neighbourhood.

*Timalia Horsfieldi*, J. and S., Ill. Orn., pl. cxix: male and female. The habitat of this species is accordingly now ascertained, it being not a rare bird in the vicinity of Calcutta. The figure alluded to is defective, in so far as that the orbits are conspicuous bright orange, and the irides pale brownish-yellow; bill black, having the conch-like membrane of the nostrils wax-yellow, and the legs are of a tolerably bright orpiment-yellow. I possessed these birds alive for some days, and noticed that they frequently placed one foot upon their food, while they picked it with the bill. In several respects, they much reminded me of *Calamophisus*; but, on dissection, I found neither the powerfully muscular gizzard, nor the large *cæcum*, or dilatation of the *œsophagus*, characteristic of that very distinct genus; which latter Mr. Swainson still strangely confounds with the Tin—*Parus* (Class. Birds, I. 43), whereto I cannot perceive that it is at all allied, either internally or externally, in habits, nidification, eggs, voice, or indeed aught else.\*

*Alaudidae*. The species of Indian Larks are extremely difficult to identify from the descriptions of them which have been hitherto published; these being, for the most part, much too concise and deficient in the needful details to be satisfactory. I have obtained four species in this neighbourhood, which are as follow :—

1. *Mirafra Ascanica*, M'Clelland and Horsfield, P. Z. S., 1839, 162; being probably also the species doubtfully assigned to *M. Javanica* by Mr. Jerdon, *Madr. Jour.* xi. 33, in which case, the

\* Since writing the above, I have obtained other live specimens of *Timalia Horsfieldi*, which I have kept some weeks; and continued observation of them has satisfied me, notwithstanding the anatomical differences above noted, that *Calamophisus* approaches much nearer to this group than to any other with which I am acquainted.—E. B.

impropriety of its topical name becomes obvious, as the species would extend over the greater part of India. Length  $5\frac{1}{2}$  to 6 inches: extent  $9\frac{1}{2}$  to  $10\frac{1}{2}$  inches: wing from bend  $3\frac{1}{2}$  to  $3\frac{1}{2}$  inches: tail  $1\frac{1}{2}$  inch: bill to forehead above  $\frac{9}{16}$  inch, to gape  $\frac{11}{16}$  inch and upwards, and vertical depth at base  $\frac{5}{16}$  inch: the penultimate fourth of the edges of both mandibles strongly inflected: tarse nearly 1 inch: the hind toe  $\frac{1}{2}$  inch; and its claw from  $\frac{1}{2}$  to  $\frac{1}{2}$  inch. The form of the wing (as characteristic of this generic group) differs much from that common to the three others, the 1st quill, which in the restricted Larks is excessively diminutive, measuring fully 1 inch: the 2nd is shorter than the 6th, and the 3rd, 4th, and 5th, equal and longest. Irides hazel; bill dusky above, the sides of the base of the upper mandible, and all the lower one except its extreme tip, whitish; legs and feet light brown with a tinge of carneous, the joints and claws rather darker. General colour ashy-brown above, the coronal feathers, interscapularies and scapularies, having broad dusky-brown centres, or they may be described as of the latter hue, slightly tipped and broadly margined laterally with cinereous, which last prevails on the nape and rump: wings and tail dusky, margined with rufescent pale fulvous, a little deeper at the base of the caudal plumes: the 3rd, 4th, 5th, and 6th primaries successively more emarginated outwards on their exterior webs, and the unemarginated portion, with nearly the whole outer webs of the other primaries excepting the two first, deep rufescent ferruginous: underneath, the wings are almost wholly of a fainter ferruginous, and the rest of the under-parts are fulvous white, somewhat deeper and marked with dusky spots on the breast, and paler on the throat: a fulvous-white streak passes over the eye; and the ear-coverts are confusedly speckled with dusky. A common species in the neighbourhood of Calcutta. It has none of the sprightliness of the true Larks, but (as observed in captivity) is a thick-built, heavy and inactive bird, prone to hide itself from observation by creeping under other birds, or availing itself of whatever sort of cover there happens to offer. The sexes are undistinguishable.

The next may, I think, be referred to the genus *Corypha*, G. Gray, or *Brachonyx*, Swainson. It is the *Oriolan* of Europeans in India, or *Baghairs* of the natives, though other species are often sold with it under the former name, especially a large Pipit which appears to be the *Asiaticus* Richard, and which is brought in great numbers to supply the tables of the luxurious towards the close of the cool season, when the present species gradually replaces it.

2. *C. baghairs*: *Emberiza baghairs*, Franklin; *Alauda Duthuensis*, Sykes. Length 6 to  $6\frac{1}{2}$  inches; extent  $13\frac{1}{2}$  to  $13\frac{1}{2}$  inches; wing from bend  $8\frac{1}{2}$  inches; and tail  $2\frac{1}{2}$  inches: bill to forehead  $\frac{7}{16}$  inch; and  $\frac{1}{2}$  inch to gape; its vertical depth at base less than  $\frac{1}{2}$  inch; tarse  $\frac{13}{16}$  inch, or nearly so: the hind toe and claw averaging  $\frac{1}{2}$  inch: representative of the usual 1st quill wholly obsolete, and what therefore become the 1st, 2nd, and 3rd, are subequal, and  $\frac{1}{2}$  inch longer than the 4th. In the typical *Alauda* which follow, the first quill exists in extreme minuteness, and the four next are longest and subequal. Irides dark hazel. Bill whitish-horny, blackish along ridge of upper mandible, and slightly on that of lower; legs brownish, and darker at the joints. This bird changes its plumage in February, and the prevalent hue of the upper parts, in newly moulted specimens, is slightly rufescent pale sand-colour, each feather having a moderately broad streak of dusky; stripe over the eye, and the whole under-parts, fulvous-white, deepening on the breast, and wholly spotless in some, in the generality a little spotted, more or less obscurely: ear-coverts tinged posteriorly with dusky: wings dusky-brown, with fulvous edgings, broader and deeper coloured on the tertiaries and tips of the coverts, and a whitish edge to the first primary only: tail also dusky, its penultimate feather having the exterior web white-edged, and the outermost feather having its exterior web wholly white to near the base, and also a considerable portion of its inner web. In the old or worn plumage, the dusky much prevails upon the back, from the fulvous edgings to the feathers having disappeared, and, in general, there is a strong rufous cast upon the crown, which is seldom very distinctly apparent in the new feathers; the breast has commonly a few small and narrow dusky streaks, and a patch of the same appears on each side of the lower part of the fore-neck, composed of the outer webs of the uppermost exterior pectoral feathers; this is more or less developed in different specimens, and less observably in the newly

moulted plumage. This species, like the last, progresses on the ground as much by hopping as by running, but has a true Lark's chirrup. It is caught in immense numbers for the table.

The next is a typical *Alauda*, allied to the European Wood Lark (*A. arvensis*), and more from a combination of collateral evidence than from the sufficiency of any description to which I have access, I conclude it to be the No. 185 of Mr. Jerdon's list, referred by that naturalist to *A. Chadeola*, Franklin, but which appears to me to be rather

1. *A. fulgula*, Franklin, P. Z. S., 1831, 119. Length 6 inches to  $6\frac{1}{2}$  inches, by  $10\frac{1}{2}$  to  $11\frac{1}{2}$  inches in extent; wing from bend  $3\frac{1}{2}$  to  $3\frac{3}{4}$  inches, and tail 2 to  $2\frac{1}{4}$  inches; bill to forehead  $\frac{1}{2}$  inch, and to gape  $\frac{11}{16}$  inch; tarsus barely 1 inch, and hind-toe and claw averaging the same. Irides dark hazel. Bill dusky above, the rest whitish; and legs pale brown. Colour of the upper parts blackish dusky-brown, relieved with contrasting pale fulvous lateral margins to the feathers; beneath fulvescent-white, deeper and spotted or streaked with dusky-black on the breast and ear-coverts partly, the remainder of the latter being suffused posteriorly with dusky: a pale streak over the eye; and the erectile coronal feathers moderately elongated: some have a rufous tinge on the small upper tail-coverts, and also margining the large quills, more especially the secondaries; while the coverts are edged with grey: the tail has its outermost feather almost wholly, and the penultimate on its exterior web only, fulvescent-white. As compared with the British Wood Lark (and writing from memory of the latter), the general cast of colour inclines less to rufous, especially about the rump, the coronal feathers are less lengthened, and the eye-streak is not carried round the occiput. This species is common, and during February more especially, is brought to the bazaar more numerously than the *Mirafra*, or than any of the other species sold as *Ortolans*, excepting the large Pipit and the *Corypha*.\*

4. *A. gracilis*, Nobs. The dimensions of this nearly accord with those of the preceding species, but the shape of the living bird is considerably more slender, and the merest glance suffices to discriminate them apart; yet on endeavouring to describe them separately, I find the greatest difficulty in hitting upon any one satisfactory distinction. The hind-claw is certainly longer and straighter in this, measuring  $\frac{13}{16}$  inch; and the aspect of the plumage is different, though not adequately so describable: the colours of the feathers are much more cleanly defined apart, and the light hue all but quite obsolete on the outer side of each scapulary and interscapulary, while in the preceding species both sides are distinctly so marked (the outer, however, being darker and browner than the inner side), and the mottling is a more confused character. On examining many specimens of (presumed) *A. fulgula*, I cannot find one in which the penultimate tail-feather is tipped on its inner web with white; but in this species it is distinctly so tipped for nearly  $\frac{1}{2}$  inch, and all its whitish or albescent is much more deeply suffused with ferruginous. I have seen but two examples of this bird, the first alive in the shop of a dealer who had sold it, and the second was shot by Mr. Frith, and presented in a fresh state to the Society, as noticed in my Report for January. When I come to know more of its notes and habits, I shall doubtless be able to describe it more satisfactorily than at present; but in the mean while I am quite satisfied of its distinctness, and should never hesitate in recognising it the moment I beheld a specimen.

Besides the above, the little *Pyrrhuloxia crucigera* is common here, as in other parts of India.† A specimen of the *Mirafra* alone existed in the Society's Museum at the period of my taking charge of it.

\* I have since obtained the young in full-grown nestling plumage, which closely resembles the corresponding garb of the British Sky Lark: the crown is very dark, with whitish edgings to the feathers; eye-streak strongly marked, and carried round the occiput as in a Wood Lark; a rufous tinge to the edgings of the great wing and tail feathers: length  $5\frac{1}{2}$  by  $10\frac{1}{2}$  inches in extent, wing  $3\frac{1}{2}$ , and tail  $1\frac{1}{2}$  inches.

† This also breeds in the vicinity of Calcutta, and the nestling plumage of the young definitively refers the genus to the *Alaudidae*, or Lark family: it essentially resembles that of the true Larks, being of a dull greyish-brown, darker and but slightly whitish-edged on the crown, scarcely at all so edged on the inter-scapularies, and most broadly on the wing-coverts; under parts dull fulvous-white, with a few narrow and minute dark pectoral streaks, suffusing part of the feathers. Length of the wings, with full-grown feathers,  $2\frac{1}{2}$  inches, and of the tail  $1\frac{1}{2}$  inch. The nest and eggs have been described by Mr. Jerdon.

*Tragopan satyrus* : male and female, and a skeleton also of the latter.

*Coturnix dactyloptera* : male and female.

*Ciconia alba* ; the European White Stork : male, female, and a skeleton of a third.

*C. leucocephala*, or *umbellata* of Wagler. (Double-tailed Stork.) This species, which is nearly allied to the smaller Adjutants, is remarkable for the singular form of its tail, which, strictly speaking, is merely rounded, and consists of twelve white feathers ; but its upper coverts are unusually broad and firm, and present the appearance of a second tail overlying the first, and which is of a black colour, and deeply forked, the outermost of these coverts being longer than the exterior true rectrices. I have not observed a similar structure in any of the allied birds.

*Ardea Caboga*, vel *russata* : second plumage.

*Machetes pugnax*. I have procured a few of these birds alive, with the intention of having them set up when they have put forth their extraordinary vernal livery, in which it is rare to find even two that much resemble each other. In the dress adverted to, I cannot learn that this species has been observed in this part of the world.

*Scolopax heterura* and *Sc. gallinula*, male and female of each.

*Totanus fuscus*, fine specimens.

*Porzana marsetta*, v. *Crex porzana*, Auct : both sexes.

*Casarca rutila*, male and female.

*Anas pacyloryncha*, male.

*Fuligula rufoa*, male.

*Sterna Seena*, ditto.

*Carbo pygmaeus*, ditto.

A small collection of bird skins from the Malay Peninsula has been purchased, containing the following species :—

*Ichthyætes nanus*, Nobis. Allied to *I. Horsfieldi*, v. *Falco ichthyætes*, Horsfield ; but considerably smaller, being under 2 feet in length, the wing 14 inches, and tail, which is a little wedged, 8½ inches ; bill over curve, including cere, 1½ inch, and 1½ inch from tip of upper mandible to gape ; tars 2½ inches ; the talons large, and all (as in *I. Horsfieldi*) completely rounded with the exception of that on the middle toe ; 4th and 5th primaries equal and longest, a little exceeding the 3rd and 6th ; colour of the upper parts somewhat light purplish-brown, darker on the quills, and the nuchal feathers having each a mesial whitish streak ; forehead, streak over the eye, throat, fore-neck, and the ear-coverts except posteriorly, white ; the whole under-parts appear to have been formerly of this colour, which in the specimen before me is nearly altogether replaced by new feathers which are wholly pale brown upon the breast, and more or less so elsewhere, the white being chiefly retained upon the medial part of the feathers, and being laterally more or less freckled with the pale brown of the rest ; some of the lengthened tibial plumes have a few nearly obsolete pale fulvous bars, the rest being white, as are likewise the vent and under tail-coverts : tail pure white at base, where impended by deep brown upper-coverts, then suffused with brown on the outer webs, and freckled with deeper brown on the inner webs, forming two or three dark spots on each, or rudimental bars ; the terminal 1½ inch dark aquiline-brown, with paler extreme tips : beneath the wing are also rudiments of a few distantly placed dark bars. Bill dusky : the legs appear to have been yellow ; and talons blackish.

*Alcedo Bengalensis*.

*Merops Phillipinensis*.

*Picus pulverulentus*.

*P. puniceus*.

*P. tristis*.

*Megalorhynchus Lathamii* : *M. spinosus*, Eyton, *P. Z. S.* 1839, 106 ; *Bucco Lathamii*, Gmelin apud Sir Stamford Raffles, (*Linn. Trans.* xiii. 284,) who describes it as follows :—" It is about six inches in length. Bill more compressed and arched than in other Barbets, and wanting the bristles at the base ; almost black in the male, but yellowish in the female. The legs are red, but

become yellowish by drying. It is found at Singapore, and also in the interior of Sumatra." The following is the ridiculous description of *B. Lathamii* in Griffith's 'Animal Kingdom' (vii. 468), "Greenish, quills dark; face and chin, brown." In Shaw's Zoology (ix. 28), the *B. Lathamii*, or "Buff-faced Barbet" (Latham), is described sufficiently in accordance with the specimens before me, except that the beak is stated to be "covered with bristles at the base, which are longer than the bill itself [! ] There is a specimen of this bird," it is added, "in the British Museum, native place unknown;" and a figure is given, perched on a full-grown tree no bigger than itself, which is worthy of the taste which placed it so. I subjoin a description of three specimens before me. The form belongs evidently to the distinct family of Barbets (*Bucconidae*, Leach), and, as compared with the true Barbets, the beak differs in being more compressed, and in having a sharp upper ridge, which instead of becoming rounded off is still sharper and more elevate to the forehead, towards which it even rises to describe an obtuse angle in the outline; the inferior angle of the upper mandible is continued backward to beneath the eye, and that of the lower mandible to beyond the eye, combining thus with the raised vertical ridge to impart an appearance of great size to the beak; the tip also of the upper mandible is prolonged to overhang the lower one; the whiskers impending the bill are reduced to minute rudiments, but the frontal and coronal plumes have the shaft prolonged and spinous. In other respects, the external structure is essentially similar to that of *Bucco*, except that the wings are rather less rounded, having the 3rd, 4th, 5th, and even 6th primaries sub-equal and longest, and the 2nd but little shorter than the 7th. Plumage of a glistening downy character on the under-parts, and colouring everywhere sombre, with some faint indications of brighter hues. Length about  $6\frac{1}{2}$  inches; of wing  $3\frac{1}{2}$  inches; and tail 2 inches: bill to forehead  $\frac{3}{4}$  inch, to gape  $1\frac{1}{2}$  inch; and tarse rather less than  $\frac{3}{4}$  inch. Colour of the upper-parts nearly uniform dusky-brown, deepest on the crown, and everywhere slightly edged with dull green; throat dingy-reddish, and under-parts glistening dull white, margined, together with the former, with yellowish green; there is also a ruddy cast on the forehead and cheeks. The beak of one specimen is nearly suffused with dusky-black, as characteristic of the male (according to Sir St. Raffles), while in the others it is pale corneous, tinged with brown at the base. Feet as described.

*Cuculus micropterus.*

*Phœnicophæus tristis.*

*Edolus affinis*, Nobis, Jante, p. 160.

*Lenius strigatus*, Eyton, P. Z. S. 1839, 103; at least according with the Latin definition excepting that the head is concolorous with the rest of the upper-parts, instead of being cinereous. It is evidently a bird in immature plumage, and the character upon which the specific name is founded would most assuredly disappear with maturity.

*Muscipets atriceps*, Nobis. Very closely allied, it would appear, to *M. Borbonica*: length 7 inches, of wing  $3\frac{1}{2}$ , and tail  $3\frac{3}{8}$  inches; bill to forehead above  $\frac{3}{4}$  inch, and to gape 1 inch; tarse  $\frac{9}{16}$  inch; tail slightly rounded: crown and nape of the male deep glossy black; the sides of the head, neck and breast, dark ashy passing into glossy-black on the throat, and into paler ash on the lower part of the breast and flanks; the middle of the belly whitish, and vent and lower tail-coverts rufescent; the rest of the upper-parts bright rufo-ferruginous, dashed with ashy brown on the interscapularies, and all the wing feathers dusky within, edged with ferruginous. The female is rather smaller, her wing measuring but  $3\frac{1}{2}$  inches, and tail  $2\frac{1}{4}$  inches; upper-parts light olive-brown, tinged with greenish-ash on the crown and ear-coverts, the wings and tail as in the male; throat and breast pale rufescent, still lighter on the flanks and middle of the belly. The female before me appears to have been an older bird than the male, with colours more matured: her tertiaries and the outer webs of the nearest secondaries, are wholly rufous; while in the male the tertiaries have a dusky stripe along their middle, and the outer webs of all the secondaries are only rufous-edged. I think it probable that the whole back of the male would become uniform bright rufous, and the throat, sides of the head, and fore-part of the neck, black like the crown.

*Eurylaimus nactus*: *Todus nactus*, Gmelin; *Cimbyrnachus nactus*, Vigors; *Eur. lemniscatus*, Raffles.

*Prinia pileata*, Nobis. This, again, appears to be an addition to the numerous species already established in this genus. Although the colouring is slightly different, the markings and disposition of the colours closely resemble those of *Timalia pileata*, Horsfield; the bill, however, being altogether different, or strictly *sylvian*, and scarcely at all laterally compressed. Size, also, inferior to that of *T. pileata*, and tail much less cuneated; length 5 inches, of wing  $2\frac{1}{2}$  inches, and tail  $2\frac{1}{2}$  inches; bill to forehead  $\frac{9}{16}$  inch, and to gape  $\frac{11}{16}$  inch; tarse also  $\frac{11}{16}$  inch. Plumage of the upper-parts olive-brown, tinged with rufous on the wings and tail, which last is just perceptibly barred, and has its three outermost feathers only on each side graduated; crown dark rufous (as in *T. pileata*), but merging posteriorly into the brown of the rest of the upper-parts, there being no ashy on the sides of the neck; superciliary streak and the whole under-parts moderately bright pale yellow, marked with black lines on the throat and breast, more developed than those of *Timalia pileata*; flanks tinged with greenish-ashy. Bill dusky, and legs apparently have been greenish. Inhabits also Tenasserim.

*Tricophorus crispiceps*, Nobis. Length 10 or 11 inches, wing  $4\frac{1}{2}$  to  $4\frac{3}{4}$  inches, and tail  $4\frac{1}{2}$  inches; bill to forehead  $\frac{3}{4}$  to 1 inch, and to gape  $1\frac{1}{2}$  to  $1\frac{1}{4}$  inch, having three or four tolerably strong vibrissæ at the gape; tarse 1 inch: no lengthened occipital bristles, but the feathers of the crown and of the cheeks anterior to the ear-coverts, of very peculiar character, being short and rigid, glistening, and of a pale golden-fulvous colour; wings and tail dull olive-green, the former dusky on the inner webs of the feathers; rest of the upper-parts ashy-brown, laterally edged with greenish, having conspicuous whitish shafts to the feathers, excepting on the rump; under-parts similar, except that the whitish medial part of the feathers is more developed; throat white, flanked by a black line proceeding from the sides of the base of the lower mandible, and another black line passes from the upper mandible through the eye; lower tail-coverts deeply tinged with the same colour as the crown: tail slightly graduated; bill black, and legs plumbeous. This species is likewise found as high as Tenasserim.

*Copsychus macrourus*, the Shahmour, male and female.

*C. saularis*: found likewise in Sumatra and Java, as in India generally.

*Vinago vernans*, two specimens.

*Hemipodius taigoor*.

*Vanellus bilobus*.

*Charadrius Virginianus*.

*Scolopax Gallinago*.

I am, Sir, yours obediently,

ED. BLYTH.



# JOURNAL

OF THE

## ASIATIC SOCIETY.

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*Notes on the Bendkar, a people of Keonjur.* By **LIEUT. S. R. TICKELL,**  
*Political Assistant, S. W. Frontier.*

In the course of my last annual tour through the Kolehān district, (January and February 1842,) I came upon a set of people, whose names and history we have hitherto been quite ignorant of, (even within the Agency,) and whose existence I only then for the first time ascertained. They comprise one insulated clan or tribe, not above 250 or 300 in number, and call themselves "Bendkars." Their habits and manners, in restricting themselves entirely to hills, assimilate them to the Kuriahs, a people well known in the mountainous districts, east and west of the Kolehān, and to be met with also in Birbhoom; but they deny any affinity to, or even knowledge of, the latter.

The Bendkars inhabit a small range of hills, called Bendkar Booroo, in the north of Keonjur, and close to Jamdapeer, (the southern border of the Kolehān.) The country is exceedingly wild, being in fact one uninterrupted sea of jungle, bounded to the N. and N. E. by the cultivated lands and villages of the Hos in Kotegurh and Burpeer, but whose limits in other directions have not been, nor probably ever will be, defined. These people have no separate language, but converse either in the Ho or the Ooria dialect, as occasion offers. In appearance they are much the same as the Bhooians of that part of the country, tolerably fair, well-made, and not devoid of intelligence; although from the excessive seclusion of their lives, they may be pronounced purely savage. By sending one of my chuprassees, with money and fair speeches, I was able to induce five or six of them to come into my camp in Sarndapeer. They were minutely questioned respecting their manners, customs, &c. but these appear to offer nothing particularly worthy of notice, being similar to those of other Semi-Hindoo tribes, such as the Bhoomijes, Bhooians, Sontals, &c. They worship *Kalee* and several tutelar *Deotas*; eat neither beef nor pork, drink water from a Ho's hand; but will not eat with them, nor would they touch food cooked by any Hindoo, even a Bramin. They have neither cattle, goats, sheep, nor pigs; but some keep a few head of poultry. Their houses are mere hovels formed of branches, leaves, and thatched with jungle grass, these are not built together, so as to form a village, but are scattered by ones

and twos about the base of the hill. Except on some few festive occasions, such as marriages, their manners are solitary and unsociable, and the poverty and misery of their mode of living almost surpasses belief, it being a common custom for a family to leave their hut in the morning, and pick up their entire subsistence for the day by grubbing in the jungle for roots, berries, hay, leaves of some species of trees; and then return as night falls, like mere wild beasts to their dwellings. When their scanty crops of maize, goradhan, (coarse rice) chutna, (gram), &c. are ripe, they fare somewhat better, and are occasionally able to bring some of the produce of their fields down to the nearest villages to barter for cloth. Their mode of cultivation is miserable; they earth up the furrows and water courses on the hill sides, and thus form small straggling *khets* or fields, which are liable occasionally to be washed bodily away, and should the crop attain maturity, the poor Bendkar is obliged to share it liberally with the wild pigs, deer, pea-fowl, and a host of such marauders, who help themselves at night to it, with impunity.

These people are not required to pay rent in money or in kind; but at the requisition of the nearest Sirdar, the Keonjur Raja's Dewan at Kalkapershaud, they are liable to be called upon as *bégars*, or coolies, to assist in conveying the baggage of the Raja, or of any of his household in their annual visits to Juggernaut. These, a very few, are acquainted with the use of money, but the majority neither know nor value it.

The party with me consisted of three men, an old woman, a girl, and a boy; the two latter were pretty. They had never seen a "white face," nor indeed even a respectable or well-dressed native. They had never even heard the word "*Saheb*," nor knew its meaning. Every thing of course was therefore a novelty and a source of amazement; the tents, horses, elephants, the sepoy and suwars with me, all attracted eager attention, not a little mixed with alarm. Only one of them had ever seen a gun fired off, and the grand exhibition of a bird shot while flying past, afforded great astonishment and delight. With all this ignorance, these poor people were pleasing in appearance, clean in person, and decorous in manner. They looked on quietly and demurely at every thing, and after a visit of two days, rather joyfully took their departure, not being, I suspect, quite satisfied of their safety while in my camp, although much re-assured by dint of gentle usage and kindness. The suwars with their bushy beards and long scarlet coats, appeared to afford them much uneasiness, and must have enforced on their minds greater awe and reverence than my less imposing costume!

They burn their dead, but do not collect the ashes, nor destroy any of the deceased's property with his body, (as the Koles do.) Their marriages are simple, being merely the bridegroom taking away his bride to his house, when the parents of both sides have consented, and have both added their quota to the stock supplied for the maintenance of the couple. No crimes (at least public crimes) appear to be known among this people, and they have no chief, or person possessing any kind of authority, to punish such. The smallness of their numbers, and

their confined locality is not satisfactorily accounted for, as they affirm they have been living on that hill alone for many generations. Nor to their knowledge, have their numbers been ever devastated by epidemic diseases. They are a perfectly peaceable race, never having been at issue with either Hos or Hindoos. They have arms, however, similar to those generally used in the country, which they employ in the chase.

The only specimen of their handicraft, which I procured from them, and which I beg, through you, to present to the Society, is the accompanying *plough*. It is used by the hand, as they have no cattle; and is capable, as may be seen, of merely scratching up the surface of the soil. It is not handled in the manner of a hoe, or *fowra*, but dragged or scraped along, as far as the sweep of the arm allows: and it will be admitted, I think, that for barbarity, the instrument is unique.

Nor.—The implement alluded to, is now in the Museum of the Asiatic Society. It is a rough hewn stick, nearly four feet long, which has been separated from the tree just below the off-shoot of a branch, at rather an acute angle with it, the off-shoot being cut down to about 10 inches long, and sharpened at the point, so as to take the ground like a rude pick axe: this is made more effective by an iron spike or peg, driven through the stick an inch or so above the off-shoot, and made to correspond in length with it. The cultivator using it, would, by dragging the implement towards him, have the soil, divided by the iron peg, and the furrow formed by the thicker substance of the off-shoot behind it.



Captain SHORTREED, in continuation of his Paper, p. 28, in No. 121 of this Journal.

1. In continuation of our researches regarding the spherical excess in terms of the two sides and the contained angle, we resume the expression

formerly given  $\tan \frac{1}{2} E = \frac{\tan \frac{1}{2} a \tan \frac{1}{2} b \sin C}{1 + \tan \frac{1}{2} a \tan \frac{1}{2} b \cos C}$  which may be other-

wise written  $\tan \frac{1}{2} E = \tan \frac{1}{2} a \tan \frac{1}{2} b \sin C \left( \frac{1}{1 + \tan \frac{1}{2} a \tan \frac{1}{2} b \cos C} \right)$ ; and the denominator within the parentheses may be expanded in the usual way.

2. For  $\tan \frac{1}{2} a$  and  $\tan \frac{1}{2} b$  substitute their values in arc to radius 1 by the formula  $\tan \chi = \chi + \frac{1}{3} \chi^3 + \frac{2}{15} \chi^5 + \frac{17}{315} \chi^7 + \&c.$  and we have  $\tan \frac{1}{2} a$

$\tan \frac{1}{2} b = \left( \frac{a}{2} + \frac{a^3}{24} + \frac{a^5}{240} + \frac{17 a^7}{39720} + \&c. \right) \left( \frac{b}{2} + \frac{b^3}{24} + \frac{b^5}{240} + \frac{17 b^7}{39720} + \&c. \right)$

and by actual multiplication we get  $\tan \frac{a}{2} \tan \frac{b}{2} = \frac{ab}{4} \left\{ 1 + \frac{a^2 + b^2}{12} + \right.$

$\frac{6 a^4 + 5 a^2 b^2 + 6 b^4}{720} + \frac{136 a^6 + 63 a^4 b^2 + 63 a^2 b^4 + 136 b^6}{40320} + \&c. \left. \right\}$

this expression and its powers being substituted in the expansion

of the original equation, becomes,  $\tan \frac{E}{2} = \frac{ab}{4} \sin C \left\{ 1 + \frac{a^2 + b^2}{12} + \frac{6a^4 + 5a^2b^2 + 6b^4}{720} + \&c. \right\} \left\{ 1 - \frac{ab}{4} \cos C \left( 1 + \frac{a^2 + b^2}{12} + \&c. \right) + \frac{a^2b^2}{16} \cos^2 C \left( 1 + \frac{a^2 + b^2}{6} + \&c. \right) - \frac{a^3b^3}{64} \cos^3 C \left( 1 + \&c. \right) + \&c. \right\}$  by

actual multiplication and reduction of terms with common factors, this becomes

$$\tan \frac{E}{2} = \frac{ab}{4} \sin C \left\{ 1 + \frac{a^2 + b^2}{12} - \frac{ab}{4} \cos C + \frac{6a^4 + 5a^2b^2 + b^4}{720} - \frac{a^3b + ab^3}{24} \cos C + \frac{a^2b^2}{16} \cos^2 C + \&c. \right\}$$

3. For  $\tan \frac{E}{2}$  substitute its value in  $\arcsin \frac{E}{2} + \frac{E^3}{24} + \&c.$  and transpose  $\frac{E^3}{24} + \&c.$ , and substituting for them their values in powers of the right

hand quantity,  $\frac{E^3}{24} = \frac{1}{3} \left( \frac{ab}{4} \right)^3 \sin^3 C + \&c. = \frac{a^3b}{4} \sin C$

$\left( \frac{a^2b^2}{48} - \frac{a^2b^2}{48} \cos^2 C + \&c. \right)$  then incorporating this and multiplying the whole by 2, we have

$$E = \frac{ab}{2} \sin C \left\{ 1 + \frac{a^2 + b^2}{12} - \frac{ab}{4} \cos C + \frac{3a^4 - 5a^2b^2 + 3b^4}{360} - \frac{a^3b + ab^3}{24} \cos C + \frac{a^2b^2}{12} \cos^2 C + \&c. \right\}$$

4. The first term is the same as that for the area of a plane triangle having the same sides and contained angle: the following terms therefore shew the difference between the areas of the two triangles. Of these terms we may take account of as many as suits our object; but in ordinary cases it will be needless to regard any beyond the two first. Limiting ourselves to these, the difference between the areas of the plane and spherical triangles

corresponds to an excess represented by  $\frac{ab}{2} \sin C \left( \frac{a^2 + b^2}{12} - \frac{ab}{4} \cos C \right)$

or by  $\frac{ab}{24} \sin C \left\{ a^2 + b^2 - 3ab \cos C. \right\}$

5. This expression shews that when  $C$  exceeds a right angle ( $\cos C$  becoming  $-$ ) the spherical area must exceed that of the plane triangle. When the two terms within the brackets cancel each other, the two triangles have equal areas; and when the second term exceeds the first, the spherical area will be less than that of the plane triangle.

6. The limits are easily assigned.

7. The sum of  $a$  and  $b$  being given,  $a^2 + b^2$  is a minimum, and  $ab$  or  $3ab$  is a maximum when  $a = b$ . In this case the triangles are isosceles, and  $a^2 + b^2 = 2a^2$ , and  $3ab = 3a^2$ ; hence the terms within the brackets will cancel each other when  $\cos C = \frac{2}{3}$ , or when  $C = 48^\circ 11' 23''$ . This for equal areas is the maximum of  $C$ . With isosceles triangles, if  $C$  be less than this, the spherical area will be less than that of the plane triangle.

8. Again when  $\cos C$  is a maximum,  $C = 0$ : In this case,  $a^2 + b^2 = 3ab$  or  $1 + \frac{b^2}{a^2} = 3 \frac{b}{a}$ ; the solution of a quadratic will give  $\frac{b}{a} = \frac{3 + \sqrt{5}}{2} =$

2.618 nearly. This is the maximum inequality in the sides so as to have equal areas.

9. In like manner may be found the value of the angle for any given ratio of the sides within these limits; or the angle being given, the ratio of the sides may be found.

10. The following Table shews for given ratios of  $a$  and  $b$  the value of  $C$  giving equal areas:—

$\frac{b}{a}$	$\cos C$	Log. $\cos C$	$C$
1.0	$\frac{200}{300}$	9.82391	48.°11'
1.1	$\frac{99}{330}$	.82588	47.57
1.2	$\frac{244}{360}$	.83109	47.20
1.3	$\frac{269}{390}$	.83869	46.23
1.4	$\frac{296}{420}$	.84804	45.11
1.5	$\frac{325}{450}$	.85867	43.46
1.6	$\frac{356}{480}$	.87021	42.08
1.7	$\frac{389}{510}$	.88238	40.18
1.8	$\frac{424}{540}$	.89498	38.16
1.9	$\frac{451}{570}$	.90783	36.01
2.0	$\frac{500}{600}$	.92082	33.33
2.1	$\frac{541}{630}$	.93386	30.50
2.2	$\frac{584}{660}$	.94687	27.46
2.3	$\frac{629}{690}$	.95980	24.16
2.4	$\frac{676}{720}$	.97262	20.08
2.5	$\frac{725}{750}$	.98528	14.50
2.6	$\frac{776}{780}$	.99777	5.48

11. If the sides were so large in regard to the radius, as that the terms omitted could sensibly affect these results, it would be necessary to take those of the next, and perhaps also of higher orders.

12. To ascertain the actual difference in the areas of the spherical and plane triangles in an extreme case, suppose an equilateral with sides of  $1\frac{1}{2}$  degrees: the direct formula gives the excess = 61.217; and the difference in the areas of the two triangles will be .3951 square miles, corresponding to an excess of 0."005245. One-third of this would be the difference on each angle, and were it ten times as great, it would still be, in Troughton's phrase, a quantity less than what is visible in the telescope.

13. It is almost needless to remark, that the supposed triangle is larger than any which has yet occurred in practice. The great triangle in the French arc, long supposed to be the largest in the world, has an excess of about 39". I have had one observed by day-light on which the excess was

about 41".5. This least side was 80 miles, and the largest 92.6. Such a triangle does not often occur, but even this has only about  $\frac{2}{3}$  of the area of that on which the difference has been shewn to be utterly invisible.

14. But as the greatest difference occurs when  $C$  exceeds a right angle, we may find the particular angle giving the maximum difference by

making  $\frac{ab}{24} \{ (a^2 + b^2) \sin C - 3ab \sin C \cos C \}$  a maximum: by differentiating, we have  $\frac{ab}{24} \{ (a^2 + b^2) \cos C - 3ab \cos 2C \} dC = 0$ :

∴ the maximum corresponds to  $\frac{a^2 + b^2}{3ab} = \frac{\cos 2C}{\cos C}$ . This is an equation which scarcely admits of a direct solution, but the indirect solution is very easy.

15. As C is to be greater than a right angle, we may put  $90 + \chi = C$   
∴  $\frac{\cos 2C}{\cos C} = \frac{\cos 2\chi}{\sin \chi}$ . As  $\frac{a^2 + b^2}{3ab}$  is always +, it is plain that  $\chi$  can-

not exceed  $45^\circ$ , nor be less than 0. Hence the quantity  $\frac{\cos 2\chi}{\sin \chi}$  will pass

through all its values from 0 to  $\infty$  every half quadrant. By tabulating this, as under, for every degree of  $\chi$ , we shall have by inspection for any ratio of the sides, the approximate angle giving a maximum difference of areas. A nearer approximation may be got by making proportion for the differences between the tabular and actual quantities in the usual way; and by computing another value on each side of the angle so found, we may by successive steps bring the approximation as close as we please.

C	$\frac{\cos 2\chi}{\sin \chi}$	C	$\frac{\cos 2\chi}{\sin \chi}$	C	$\frac{\cos 2\chi}{\sin \chi}$
91	1.75788	106	0.48808	121	9.95977
92	.45612	107	.45204	122	.91763
93	.27881	108	.41798	123	.87320
94	.15217	109	.38389	124	.82601
95	.05306	110	.35020	125	.77546
96	0.97117	111	0.31674	126	9.72076
97	.90101	112	.28336	127	.66088
98	.83929	113	.24989	128	.59433
99	.78387	114	.21620	129	.51901
100	.73332	115	.18212	130	.43160
101	0.68657	116	0.14750	131	9.32661
102	.64285	117	.11217	132	.19372
103	.60157	118	.07595	133	8.00980
104	.56286	119	.03864	134	7.70105
105	.52453	120	.00000	135	—∞

16. By means of this and the former Table, it appears that with equal sides the angle of maximum difference of areas is somewhat greater than  $124^\circ$ , and by another computation it will be found that the exact value is  $124^\circ 02' 35''$  being the greatest angle giving a maximum difference of areas. For any other ratio of sides the angle will be smaller. For the ratio  $\frac{3 + \sqrt{5}}{2}$  the angle is

$120^\circ$ . When the ratio is  $\frac{10}{1}$ , the value of

$\frac{a^2 + b^2}{3ab}$  is  $\frac{101}{30}$  and  $\text{Log. } \frac{\cos 2C}{\cos C}$  is 0.52720, which corresponds to an angle

of about  $4' 25$  less than 105, or  $104^\circ 55' 75$ ; and so in other cases. When the ratio of the sides becomes indefinitely great, the maximum difference angle approaches indefinitely near  $90$ .

17. In well chosen triangles, there are not usually any very great differences in the sides, and hence practically the greatest differences will usually occur when C is not far from  $120^\circ$ .

18. If for example we suppose a triangle with sides of a degree each, and containing an angle of  $120^\circ$ , by the original formula the excess is  $27'' 210$  and the difference in area between the spherical and plane triangles is 0.18214 square miles, corresponding to an excess of  $0'' 0024176$ . On a triangle with degree sides and the maximum angle of  $124^\circ 02' 35''$  the excess is  $26'' 035$  the differences of areas 0.18320 square miles, corresponding to an excess of  $0'' 0024318$ . Such differences though utterly in-

visible in the telescope, are still much greater than have ever occurred in practice; for though single sides of more than a degree be nothing very extraordinary, it is but rarely that two such sides can be found forming a triangle with a third side of from 118 to 120 miles.

19. The difference here treated of is, in similar triangles, proportional to the 4th powers of the homologous sides: Hence, in an equilateral with half degree sides, this difference would be  $\frac{1}{81}$  of  $0''\cdot005245$ , or  $0''\cdot00006475$ ; and on the isosceles with half degree sides containing  $120^\circ$ , the difference would be  $\frac{1}{16}$  of  $0''\cdot0024176$ , or  $0''\cdot00001511$ . Triangles such as these are not very uncommon, but it is much more common to have triangles with less than half of their area.

20. It is thus fairly proved that the difference between the excess on a spherical triangle computed rigidly, and that deduced by reckoning its area as equal to that of a plane triangle of the same sides and contained angle, is a quantity so small that, even in extreme cases, the neglect of it will induce no sensible error; and that in triangles such as usually occur in practice, the difference is so utterly insignificant, that to go much out of the usual way in order to take account of it, would be a very needless refinement.

*Notes regarding the Meteorology and Climate of the Cape of Good Hope.*

*By ROBERT TROTTER, Esq. Bengal Civil Service.*

When last at the Cape it occurred to me, that a few particulars regarding the climate of a place, to which so many resort from this country in search of health, might be found interesting as well as useful: and particularly to medical men, by enabling them to judge how far it is likely to prove beneficial to those patients, for whom they may consider an absence from India necessary. If you deem the accompanying Meteorological Table, and the following cursory remarks worthy of a place in your Journal, I shall feel obliged by your inserting them.

The table contains an abstract I prepared from the Meteorological Registers of the Royal Observatory at the Cape, shewing the mean monthly weight and temperature of the atmosphere, and the minimum of each month for three years together, with the monthly fall of rain for the same period; and in order to compare the results with the climate of India, I have inserted corresponding observations made at Calcutta for an equal period, and likewise the monthly means of a year's observations at several other stations; viz. Darjeeling, Dacca, and Cawnpore, extracted chiefly from the *Journal of the Asiatic Society*.

The Cape observations were made at 3 hrs. 15' P. M., being the period of least atmospherical pressure; the Thermometers hang on the South-



east side of the building, in the shade, and protected from solar radiation; 4 P. M. is the hour of most of the Indian observations, a few only of those at Darjeeling having been made at 4 hrs. 30' and 5 hrs. P. M.—the time of each set of observations therefore, being about an hour after the hottest period of the day, a rough estimate may be formed of the usual afternoon temperature, as well as a pretty fair comparison of the maximum temperature of the above places with that of the Cape, while from the means of the monthly minima, a comparison may be formed of the greatest average cold at the Cape and Darjeeling.

As Cape Town lies close to the base of Table Mountain, which, together with the Lion and the Devil's Peak encompasses it on three sides, its temperature is considerably higher than that of the Observatory, which is nearly three miles distant, and being situated on the low isthmus between False Bay and Table Bay, enjoys the benefit of the breeze which generally blows from one bay or the other.

The Camp ground, Rondebosch, and Wynberg, possess a similar advantage in point of situation over Cape Town, (from which they are distant from 4 to 8 miles.) They are the favourite abode of Indian visitors during the warm months, but as they lie nearer than the Observatory to the mountain, the weather is much damper, and the fall of rain considerably greater during the winter, than at that place. In the hot weather, however, they certainly enjoy a cooler climate, in consequence probably of the greater abundance of verdure and shade.

Table Mountain, and indeed the whole range of hills, of which the Devil's Peak is the northern extremity, produce a variety of interesting atmospherical phenomena, and often times occasion an entire difference in the state of the weather at Cape Town, which is situated on the west side, and at Wynberg and Rondebosch on the other side of the range.

The north-west winds which prevail during the winter, are always loaded with much vapour, and bring much rain, but as the rain is frequently not formed till the vapour, after passing over Cape Town, has reached the cold summit of the mountain, it very often happens that though a fine day in Cape Town, it is raining heavily at Wynberg, Rondebosch, and other places on the lee side of the mountain. During the summer months, the same cause gives rise to a similar phenomenon, and occasions the well-known appearance on the top of the mountain, called the Table Cloth. The south-east sea breeze, which prevails at this



season, unlike our Indian scorching hot winds, is cool and refreshing even in the hottest weather, and not being so highly charged with humidity as the northerly winds, the vapour it contains frequently passes over the mountain without becoming visible. Oftener, however, it is changed into a mist or cloud, which covers the top of the mountain, and is seen on the lee, or Cape Town side, rolling down in large fleecy volumes, till it reaches a warmer temperature, when it again becomes invisible. The elevation of this vanishing point varies with the hygrometric state of the atmosphere, and the line, thus formed, is so distinct that were degrees to be marked on the perpendicular cliffs which over-hang Cape Town, a gigantic, but correct hygrometer would be furnished. I may here express my regret, that I possess no notes of the hygrometric condition of the atmosphere of the Cape, sufficiently accurate to be recorded.

The different eddies and counter-currents of air produced by the influence of the mountain, and by the interruption it occasions to the general current of air, are also interesting phenomena. Among others, a remarkable one is often experienced by ships entering the Bay with a fair wind. On reaching a certain point they are frequently taken a-back, and find themselves in a strong breeze blowing right out of the Bay; and few who have lived at the Cape can have failed to observe occasionally, a northerly and a southerly wind blowing at the same moment in different parts of the Bay, a line of confused ripple clearly marking the limits to which the adverse winds, extend; and I may add another curious appearance I have repeatedly observed at Wynberg in winter, when north-westerly winds are bringing large clouds over the mountains; viz. a circular spot of blue sky in the direction of Constantia, about  $10^{\circ}$  to  $15^{\circ}$  in diameter, and about  $20^{\circ}$  from the zenith, on reaching which the clouds become invisible, but after passing it, they resume their former appearance. It may probably be accounted for by their meeting at that point a current of rarefied air, which having found its way through a neighbouring gap in the range of mountains, has not been cooled by passing over their summit. Those acquainted with these localities well understand that the gap alluded to, is that through which the road to Hout's Bay passes.

I may conclude these remarks, with a memorandum of the mean temperature of Cape Town, and three other localities in the interior, extracted from a printed statement I fell in with at the Cape, but I can

neither attest its accuracy, nor explain how the means, there given, have been obtained.

“ The mean temperature of Cape Town, inferred from a Meteorological Journal kept there for several years, is  $67\frac{1}{2}^{\circ}$ —the mean temperature of the coldest month is perhaps  $57^{\circ}$ —hottest  $79^{\circ}$ —mean of three recent winters  $58^{\circ}$ —of three summer months  $77^{\circ}$ —least heat during summer  $63^{\circ}$ .”

“ The temperature of the district of Stellenbosch deduced from the observations of a single twelvemonth is  $66\frac{1}{2}^{\circ}$ —extremes  $87^{\circ}$  and  $50^{\circ}$ . The temperature of Zwartland appears to be  $66\frac{1}{2}^{\circ}$ —extremes  $89^{\circ}$  and  $54^{\circ}$ —the exposure of the thermometers is at neither place external; they are suspended in spacious well-aired halls.”

“ At Tulbagh, situated in a valley of the great chain of mountains which divides the western from the eastern provinces of the colony, the mean temperature of the year is  $66\frac{2}{3}^{\circ}$ —that of the coldest month  $55\frac{1}{2}^{\circ}$ —of the hottest  $80\frac{1}{2}^{\circ}$ —extremes  $94^{\circ}$  and  $92^{\circ}$ —mean of the three winter months  $56\frac{1}{2}^{\circ}$ , of three summer months  $79^{\circ}$ ; least heat in summer  $61^{\circ}$ .”

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CAPE OBSERVATORY.

Mean of Observations made at 3° 15' P. M.

	1837-38.				1838-39.				1839-40.				Average.			
	Barm.	Ther.	Min.	Rain Ins.	Barm.	Ther.	Min.	Rain Ins.	Barm.	Ther.	Min.	Rain Ins.	Ther.	Min.	Rain Inches.	
July, .....	30.257	62.3	39.8	1.16	30.163	57.5	38.3	3.48	30.310	59.9	30.5	1.77	59.9	36.3	2.14	
August, .....	.163	59.7	37.	1.81	.154	60.4	38.3	2.51	.157	59.6	36.4	2.72	59.9	37.2	2.35	
September, .....	.418	60.3	39.	2.41	.141	61.2	37.	1.50	.196	62.7	43.7	0.49	64.7	39.9	1.47	
October, .....	.168	65.5	40.5	0.45	.138	69.2	41.	0.24	.066	65.8	42.	1.80	66.8	41.2	0.86	
November, .....	.081	59.3	48.4	1.24	.038	70.	50.3	2.39	.051	70.3	47.7	0.12	66.5	52.1	1.25	
December, .....	.055	71.7	47.8	0.57	29.993	70.1	50.6	1.54	.031	70.1	52.8	1.60	70.6	53.7	1.24	
January, .....	29.996	74.3	52.	0.0	30.057	73.7	52.5	0.12	.061	74.3	46.8	0.51	74.1	50.4	0.21	
February, .....	30.004	75.4	52.8	0.6	.032	74.9	54.4	1.18	.012	73.8	48.9	0.28	74.7	52.2	0.51	
March, .....	.071	72.	52.8	0.16	.099	71.8	49.	2.32	.050	74.1	47.8	0.00	72.6	49.9	0.83	
April, .....	.101	67.8	47.5	1.22	.128	68.9	40.5	0.65	.071	68.	47.7	3.03	68.2	45.2	1.63	
May, .....	.173	61.8	44.	4.33	.161	62.4	35.	2.19	.114	63.8	39.	1.68	62.7	39.3	2.73	
June, .....	.174	59.5	36.8	5.53	.279	60.4	37.5	1.68	.205	58.5	39.4	4.20	59.5	37.9	3.80	
Total fall of rain, ..	..	..	..	1948	..	..	..	1980	..	..	..	1820	..	..	1902	
Yearly average Temperature, ... }	..	65.8	..	..	..	66.7	..	..	..	66.7	..	..	66.5	44.6	..	

	CALCUTTA.										1837.		1840-41.	1834-5.
	<i>Mean of Observations at 4° P. M.</i>										<i>Darjeeling.</i>		<i>Dacca.</i>	<i>Cawnpore.</i>
													Mean Temp. at 4 P. M.	Mean Temp. at 4 P. M.
	1836.		1837.		1838.		Average				Mean Temp. at 4 P. M.	Monthly Minimum	1841.	1835.
	Barm.	Ther.	Barm.	Ther.	Barm.	Ther.	Ther.							
January, . . . . .	29.946	68.8	29.970	75.3	29.903	74.5	72.9		43.4	32.8	70.9	69.5		
February, . . . . .	.874	74.3	.919	81.9	.872	82.	79.4		45.5	34.2	58.8	74.7		
March, . . . . .	.787	83.9	.775	90.9	.757	89.5	88.1		55.7	43.1	82.	81.4		
April, . . . . .	.620	90.9	.639	94.4	.621	93.	92.8		60.2	48.1	89.1	92.1		
May, . . . . .	.542	95.9	.585	94.8	.574	96.	95.6		60.	50.	88.	100.		
June, . . . . .	.460	90.	.502	94.	.133	89.7	91.2		64.5	55.8	86.5	93.		
July, . . . . .	.504	86.2	.435	86.2	.448	86.8	86.4		63.5	57.3	76.	88.2		
August, . . . . .	.472	87.5	.508	85.7	.487	86.4	86.5		63.5	57.4	85.9	90.3		
September, . . . . .	.581	87.7	.613	88.2	.620	87.5	87.8		62.3	55.2	58.1	88.6		
October, . . . . .	.815	86.3	.753	86.5	.793	86.4	86.4		60.5	49.5	82.8	1834. 80.7		
November, . . . . .	.862	80.3	.864	80.7	.849	81.3	80.8		53.5	43.5	79.1	77.7		
December, . . . . .	.989	75.1	.933	75.3	.893	78.	76.1		47.6	39.9	70.4	71.0		
Yearly average } Temperature, . . . . }	..	..	..	..	..	..	85.4		56.7	47.2	77.3	84.		

*Report upon the Manufacture of Steel in Southern India. By Captain CAMPBELL, Assistant Surveyor General.*

The mode of making the Indian Cast Steel, or Wootz, is up to the present time a paradox with the learned of Europe.

Dr. Buchanan in his "Tour in Mysore," published the first account of the process, which he describes as fusing two pieces of iron in a crucible, two pieces of wood, and two green leaves.

In the 26th No. of the *Madras Journal of Science*, is given a reprint of a paper by Mr. Heath, with reference to a letter addressed by the Royal Society to the Right Honorable the Governor of Madras, in which he repeats Buchanan's statement, and speculates upon the theoretical action of the gases evolved from these two green leaves; but that he was unacquainted with the true principle of the process is made evident by his notice of Dr. Pearson's and Mr. Stoddart's opinions, that the steel is a natural product.

As supported by the opinions of good authorities upon the subject, it does not appear that any one has been sufficiently presumptuous to think of doubting the fact. This I, however, have taken the liberty to do, in some remarks published in the 6th No. of Dr. McClelland's *Calcutta Journal of Natural History*.

As it appeared to me that the native process of smelting iron was very rude and imperfect, and admitted of considerable improvement, without making such alterations as would be impracticable for the familiar use of the natives of India, I have had furnaces constructed, exact models of those in general use, and have had their process repeated, so that I might have opportunities of minutely examining every step of the process.

A result of my investigations, is, that the iron sand of India has the property, by a peculiar modification of the blast, and proportion of the fuel, of affording a natural steel of good quality as an immediate product of the ore, or what is technically called, a "natural steel," and on examining the common iron made by the natives from this ore, I find that it always contains  $\frac{1}{4}$  of steel, and often one-half of its weight.

As the iron used at the localities mentioned by Buchanan is made, (to my knowledge,) from the iron sand, the above fact at once affords an explanation of the process so long paradoxical which is, that the

supposed iron put into the crucible with the pieces of wood, and two green leaves, was two pieces of natural steel, which I have found by experiment in my blast furnaces to melt very easily.

This natural steel has the property of welding, from which the natives call it iron, and it must have been thus that they misled Dr. Buchanan; while cast steel, the only one they are acquainted with, falls to pieces like sand upon being heated to a white heat.

From its property of welding, this natural steel is peculiarly valuable for making axes, bill-hooks, and tipping plough shares, and the cheap rate at which it can be made (about 2 annas for 6 pounds) is of considerable consequence to the poor and labouring class of natives, as the only steel now procurable in India is sold at the rate of 3½ pounds for a rupee.

For coarse purposes, natural steel is imported largely into England from Germany, and Styria, and it is probable that from the cheap rate at which the above natural steel can be made in India, that it may prove to be a valuable article of export from South India to Europe; and as the granitic tract of the Barramahal affords inexhaustible quantities of the iron sand and fuel, there can be but little doubt of the possibility of the manufacture.

I have no intention of concealing the mode of producing the natural steel; but as my researches upon the subject are yet in a very crude state, and as much further investigation by chemical analysis is necessary into the composition of the iron sand, (which is a titaniferous mineral,) the various scorias of the furnace, and the compositions of the steel, and the theory of its formation, I shall reserve these particulars for a more complete report upon the subject.

*Royacottah, 5th October, 1841.*

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*Report upon the Improvement of the Silk manufactured in Mysore and the Salem Districts. By Captain J. CAMPBELL, Assistant Surveyor General.*

In the Salem district, silk is manufactured in small quantity, in Bairkay and Bangalore, and in a few small villages. In Trippatore it was formerly attempted to be introduced, but has failed for some reason not recorded.

In Mysore, silk is manufactured in much larger quantities, and it appears to be increasing very rapidly.

The manufacture is almost solely in the hands of the Mussulman population; and averse as the Mussulmans generally are to any field labour, or labour of any kind which requires much bodily exertion, the encouragement of this manufacture requiring but light labour, and only periodical attention, may prove valuable means of making productive a large proportion of the inhabitants of South India.

The quality of the silk as generally made is very bad, being simply reeled from the cocoons heated in a large earthen pot upon a large, rude reel, with four bars placed immediately over the vessel; and no attempt is made to remove the useless silk upon the surface of the cocoons, or to keep them clean from dust or dirt, nor to prevent the silk adhering by its gum upon the reel.

The value of the common silk varies from two Rs. to three Rs. per ser of 24 Rs. weight, and it is principally consumed in the country at Walhijapet and Salem, where it is used in ornamenting the borders of cotton cloths, and for weaving into coarse silk cloths; and I believe that its quality is at present too bad to fetch any price whatever in the English market.

The demand for this inferior silk in the country must be limited; and it is probable that the only mode of increasing the manufacture is to increase the quality, so as to fit it for exportation to the London market.

It is well known that silk of good quality can be made in South India, from the fact of the manufacture being carried on at the present time by some European settlers.

The machinery used in Europe for reeling silk is beyond the means of the natives of India, who are generally very poor, but upon looking over the plan and drawings of these machines, it has occurred to me, that by a simple modification of the machine, I shall be able to construct them of cheap materials, upon a plan which may be probably made up by any one, even not a workman, for five rupees.

It is my intention to construct some reels upon this plan, and having proved their efficiency by experiment, to report again upon the subject, and to forward specimens of the silk manufactured with them.

The process of reeling silk is simple and easy, and the manipulation though delicate, is not difficult for any native to acquire; and there can

be no doubt that if a few models of the improved machines were distributed, and a small establishment set up where they could be seen in use by those who choose to attend to learn the process, that the necessary information would be rapidly disseminated ; for the indigent Mussulmans, in whose hand the manufacture now is, are generally very apt and intelligent, and unlike the Hindoo population, are quite sensible of, and ready to appreciate and make use of, the advantages of any improvement.

The principal difficulty in the improvement of the manufacture was suggested to me by one of these persons now employed in it, which is the difficulty of finding a market for the improved article at a remunerating price.

To produce an improved article, an increased expence must be incurred in labour, attention, and time, while a considerable loss of weight will result from removing the outer part of the floss upon the cocoons, and the dirt and impurities which are now reeled with the silk ; and as the manufacturers possess no capital, and are so poor as to depend for a market upon the spot, they are obliged to sell the silk to the native *bukkals*, who will not give more than a very trifling increase of price, as the present consumers are not particular about the quality of the material.

To encourage the manufacture of an improved article, it appears to me that the only way will be to purchase it upon account of government, when it can be shipped to England, and sold as the products of the Bengal government filatures used to be.

It is not probable that any encouragement to the manufacture would ensue from allowing the Native Revenue Officers to effect the purchases, for it is probable that they would make them at a low rate, and debit the government with a higher, or if the disbursement of the money was not entrusted to their hands, that they would exact a premium from the sellers before they granted acknowledgments for the receipt of the silk upon account of government.

By appointing an European superintendent, who might travel about the country and examine the quality of the silk prepared, and make the purchases at stated times, disbursing the price himself, much of the objections might be obviated, as subordinate native examiners and purchasers might be employed under him, upon whom a sufficient check might be kept up.

The government price might at first be fixed very high, as high as







the selling price in London would admit of, as a premium rate ; after a certain sum had been disbursed, proportionate to the extent of the manufacture, the government price might then be annually and gradually decreased until it became low enough to enable the merchants of Madras to enter into competition, and make their purchases from the government sales in this country ; as the government price became still further decreased, the Native *bukkals* upon the spot would at last, by raising their prices to the highest they could afford to give, at last take the purchases altogether into their own hands, and the purchases upon account of government might cease ; while any immediate and considerable fall in price might be prevented by the government price being offered whenever the selling price fell low enough.

*Royacottah, 5th October, 1841.*

### MANIS CRASSICAUDATA., (*Auct.*)

M. PENTADACTYLA, (*Ibid*). SHORT-TAILED OR THICK-TAILED MANIS.

In Hindustan, generally called "*Bujjerkeet*."—Orissa, "*Bujjer Kapta*" and "*Sooruj Mookhee*."—By the *Larka Koles*, "*Armoo*."—By Lieut. R. S. TICKELL, Political Assistant, S. W. Frontier.

Dimensions and description of a male specimen brought alive into Ghassa, March 18, 1842, preserved and presented to the Museum of the Society, April 1842.

	<i>Feet. Inches.</i>	
Extreme length from muzzle to end of tail, . . . .	3	6½
Length of head, . . . . .	0	4½
“ of body, . . . . .	1	8
“ of tail, . . . . .	1	6
From muzzle to inner corner of eye, . . . .	0	2½
“ Last to rim of ear, . . . . .	0	1
Top of back to roots of claws, (of fore feet,)		
following the curve of the body, . . . . .	0	11
Humerus, . . . . .	0	3½
Radius, . . . . .	0	3½
Carpus to roots of fore claws, . . . . .	0	1½
		2 6

	<i>Feet Inches.</i>		
Outer claw, . . . . .	0	0 $\frac{1}{4}$	} Measured as chords to the curve.
Next ditto, . . . . .	0	1 $\frac{7}{8}$	
Middle ditto, . . . . .	0	2 $\frac{1}{4}$	
Index ditto, . . . . .	0	1 $\frac{1}{2}$	
Thumb ditto, . . . . .	0	0 $\frac{3}{4}$	
Femur, . . . . .	0	4	
Tibia, . . . . .	0	3 $\frac{1}{4}$	
Os calcis to end of foot, . . . . .	0	3	
Girth round body about its centre, . . . .	1	8	
Breadth of tail below at base, . . . . .	0	4 $\frac{1}{2}$	
Length of tongue, protruded portion, . . .	1	0 $\frac{1}{4}$	

*Teeth.*—None. *Mammæ* 2, pectoral. *Clavicles* ——— ?

*General aspect.*—Body and tail thick, the latter much flattened, the section would be an obtuse angle, with curvilinear apex. Limbs short, stout, very muscular; the entire figure giving evidence of the enormous power of the animal. Head small, with elongated muzzle, a well shaped nose, (somewhat as in a dog), small mouth; eyes very small, placed far backward, and close to the ears. Ears small, with rounded helix, scarcely any tragus, exceedingly simple (externally) with a very small concha. The anterior extremities furnished with long stout claws, of which the outer ones are almost rudimentary. These claws do not expand (naturally) beyond at right angles to the sole of the paw, the animal therefore in walking bends them in and treads on the knuckles, or rather on the roots of the claws. The five claws of the hind foot are small, barely touching the ground, and the foot resembles that of a tortoise, being oval, with a thick, cushion-like sole. General outline of the figure much hogged or curved on the back, with the tail pressed flat along the ground.

*Tongue*—Is flatly or sub-cylindrical ending in a depressed point, consisting of a central cylindrical part, and two outer flattened or laminous edges. The tongue can be drawn above a foot out of the mouth, but it is doubtful whether the animal can voluntarily protrude it to such a length. When so far extended, the skin of the tongue towards the root in returning appears to admit the tongue back into itself, so that the latter has the appearance out like a telescope. It is all over covered with a slightly viscid saliva.

*Eye*—Is small, dull, pupil circular, and as in bats or moles, barely distinguishable from the iris. A very strong opaque nictitating membrane. No eye-lashes to either lid.

*Genitals (male)*.—A small longitudinal slit, in the apex of a rounded soft wrinkled bag, with the anus immediately behind. Testicles internal. No apparent penis. The belly and the under-surface of the tail being on the same plane, and the latter not capable of bending upwards, it is difficult to imagine how the *Manis* copulates: not improbably face to face.

*External Covering*.—The upper part of the animal, and the outside half of each limb are clothed with horny sharp-edged scales, not very regularly disposed except on the tail. The nose is bare, and excessively tender; about  $\frac{3}{4}$ ths of an inch from it commence series of scales, extending laterally to within  $\frac{1}{2}$  an inch above each eye: these are small and hexagonal, and extend to the back of the head skirting the ears. From this point the scales of the back commence, they are looser, larger and more irregular in their order of imbrication; they are as nearly as possible disposed in eleven longitudinal rows, five on each side decreasing in size towards the belly, and one series along the dorsal line. On the tail are five series, the three central of which are regularly disposed. The scales of the lateral rows are bent or curved inwards, so that their long apices present a blunt edge along the whole length of the tail. In other words, these scales embrace or enclose the edge of the tail. The under part of the tail is flat, and covered with smaller rounded scales, which commence abruptly from a line about an inch in rear of the arms. The scales of the anterior limbs commence on a line down the middle of the inner side of the arm, from whence they diverge outwards and upwards, gradually assimilating (on the shoulder), to the order of the series on the back. The scales of the hind legs commence just below the knee, and the order of the series is downwards to the edge of the sole enveloping the outside semi-circumference of the limb. The nose, sides of the face, inside of the limbs, the entire thigh, and the whole of the under-parts to the root of the tail are naked and clothed with a soft whitish wrinkled skin. The soles of the fore-paws are smooth and flabby, (as they never touch the ground in walking.) Those of the hind feet, on which the animal rests, are black, tough, and spongy. The face is smooth, like that of a scalded pig, eyelids devoid of lashes. From be-

hind the eye to the throat the skin lies in transverse folds or creases, of which the most conspicuous is formed by a continuation as it were of the helix of the ear, extending round the jowl. On the belly the skin lies more in longitudinal wrinkles. Between and underneath the scales on all parts of the body are brownish bristly hairs, few and scattered, here and there a solitary one visible.

*Colour.*—Eyes black, nose dirty reddish or flesh-colour. All the bare parts pale brownish-white, a little darker or smudged about the muzzle. The claws a pale-horn or brownish-white. The scales pale-horny or clay-colour, those on the head darker and shaded with a brownish neutral tint. Under the tail also the scales are washed with a blackish tinge. Soles of hind feet blackish.

*Scales.*—The shape of the scale is, for the most part, on the head, hexagonal: on the body a rounded four-sided outline. Some scales more semi-circular, others more pointed. But all or most, so jagged and broken as to be very irregular; on the tail they are more evenly semi-circular. The series on each side the tail present two planes or surfaces, being bent down along the middle, so as to cover both the upper and under-surface of the tail. The scales are generally smooth exteriorly with sharp edges, underneath they are more or less marked with transverse ugæ.

*General remarks on the Viscera, &c.*—On opening the body, the viscera did not present the irregular or peculiar formation and arrangement which might have been expected from so singular an animal, and the general appearance of the contents of the body struck me, as far as my limited knowledge of anatomy allowed, as very like that of the human subject. The heart, large, shaped as in man, with two auricles, and two ventricles. The lungs of proportionate size, and of a remarkably bright colour. Diaphragm exceedingly thick and tough. The liver small, with two lobes, resting above the centre and right of the stomach, but not extending so far down as the latter. The gall-bladder exceedingly large, equal in size to that of a sheep. Pancreas and spleen situated as in man, and well proportioned. Kidneys very large.

The stomach shewed some remarkable peculiarities. The cardiac opening and pylorus apparently both on the same side, and close to each other. In the region of each, the stomach immensely muscular,

having the appearance of the gizzard of rasorial birds. The left half of the stomach thin, membranous, and distended with wind. Œsophagus very small. The different parts of the intestines not distinguishable. There appeared to be a duodenum 8 or 10 inches in length, and the rest seemed to be ileum, being of the same size throughout, slender and much convoluted, till it ended in the rectum, which is very large. No cæcum was discoverable. The stomach is very large, extending almost entirely across the abdomen. The two muscular portions above noticed, felt to the hand as hard and round as racket balls, and rather larger in size. On opening the cardiac division, it was found to be full of gravel, quartz stones nearly half an inch long, the debris of large black ants, and a perfect bundle of intestinal worms. These were long, thin, cylindrical, semi-transparent, from one to two inches long, and pointed at either end. The muscular portion near the pylorus contained the debris of the ants, more digested and approaching the appearance of faeces, mixed and hardened by the mixture of gravel, but without the large stones. The left and largest portions of the stomach was a mere thin membranous bag, distended with wind, and here, as well as in the cardiac gizzard, and even in the œsophagus, the worms swarmed. The faeces of this animal when ejected are peculiar, being in the shape of black, shining, truncated cylinders, about  $2\frac{1}{2}$  inches long and  $1\frac{1}{2}$  in diameter. Void of smell, and dry, with no appearance of having been affected by bile.

The glandulæ renales large, and communicating by a duct, through a double glandular-looking perforated excrescence, into the urethra, not far from its mouth. No external parts of generation visible, except the opening of the urethra, which is prodigiously large. On either side, and within the skin are two well proportioned testicles; but no where could I detect the trace of a penis. Close in front of the orifice of the urethra, is a sinuosity or fall in the skin, resembling a shallow rudimentary sac. It appeared like a navel, but I could discover no communication from it inwards. These do not appear to be any secreting glands or follicles about the anus, although the animal emits a peculiar and offensive odour.

The subject from which these remarks are taken, died with its long tongue protruded, and for about 20 hours before dissolution it was unable to retract it. This prevented my being able to see the manner

in which the tongue, when within the mouth, is folded up. But a great part of the basal portion, as before observed, appears to slide into itself, or into the outer skin of the tongue, and probably lies along under and in front of the oesophagus.

The process of skinning the animal for preservation was extremely toilsome and difficult, on account of the scales being deeply imbedded in the skin, which is indented throughout by them, the hollows so formed being filled up by the dorsal muscles. All the muscles and tendons are of great toughness, the flesh having a harsh and coarsely fibrous appearance. The pectoral muscles and those of the forearm and neck (*platysma myoides*) are of prodigious volume, and the latter covered with masses of fat, which I at first took for large conglomerate glands.

The bones are short, thick, and with reference to other animals disproportionately powerful. The dorsal and caudal vertebræ perfectly immense, ribs 13 pair, of which the last 5 pair false. The stout, solid sternum has its ensiform process elongated almost to the centre of the abdomen, or beginning of the umbilical region, that is, to where the umbilical region generally is, for in this animal I suspect the navel is quite close to the genitals. This ensiform process is in shape like a young plantain leaf, and has a thin pair of muscles spreading along each side of the centre or stalk. The skull is long and narrow, and apparently without sutures. The zygomatic arch small, lower jaw very weak; nasal bones much elongated, and suddenly truncated at the muzzle. The brain very small in volume. I was unable, from want of time, to examine with sufficient attention whether the animal possesses clavicles or not; my impression however is, that they are wanting.

*Remarks.*—The *Manis* is the rarest quadruped, I imagine, in India, owing perhaps as much to its habits as to want of numbers. During six years' residence in and near the forests of Singbhoom, I have only seen two living specimens. It is, however, not confined in locality, being known throughout Central India, where in the upper provinces it is called "*Bajjerkeet*." In Orissa and Bengal "*Bajra Kapta*" and "*Sooruj Mookhee*," and in the old Shunskrit still applied to many words further south, on the Peninsula, in the Madras presidency, "*Vajra Keeta*." By the Lurka Koles it is called "*Armoo*," and in the islands of the Eastern Archipelago, "*Pangoe-ling*." "It has been described also



in our books of Natural History, under the name of Phattagen, and Manis." The *Manis Crassicaudatus* and *M. Pentadactylus*, (Auctorum,) are I suppose one and the same.

*Habits, &c.*—In Singbhoom the Armoo lives principally in the neighbourhood of rocks, from whence it rarely wanders. The specimen from which the present details were taken was captured on a pretty high hill. Of its manners very little is known, as the animal is strictly nocturnal, and its retreats, in the fissures of rocks, are so impenetrable, that I have never heard of the young being seen or taken. In Shaw's Zoology, in Geoffroy's Cuvier, and in other works, the Manis is represented upon a branch of a tree; but I very much doubt whether it possesses the power of climbing, although its fore claws are not unsuited to the purpose. Its food also, which consists of large black ants, is found as much upon trees as on the ground; but the weight and clumsiness of the animal impeded by a stiff tail which scrapes along after it, is repugnant to the idea, and of those people who have met with them in the jungles, none ever mentioned seeing one on a tree.

Quitting, however, doubts and conjectures, I shall content myself with describing the manners of two specimens I had alive for some days in my possession. One was brought to me in 1838. It had been captured by some Koles at dawn of day, on the ground, in a patch of low jungle or bush; being unable to progress beyond a slow trot, or to bury itself fast enough in the ground, it was easily taken. The animal has no means of offence; when handled or even approached it rolls itself into a ball, tucking its nose (the only part about which it appears solicitous) under its belly, folding in its legs, and wrapping the tail round all. When brought to me and laid on the ground, it remained for some time in this position, but at length cautiously unrolled itself, looking about and sniffing the air in all directions. The slightest noise, or knocking and scraping on the ground near it, would make it instantly resume its former position, from which the united strength of two men could not unwind it. If, however, left unmolested, it would after a little reconnoitring thrust forth, first one leg, and then the other, and so, starting to its feet, commence perambulating the apartment. In walking it stepped upon its knuckles, or more strictly upon the roots of its fore claws, which were bent closely inwards to the leg, the tail pressed to the ground. Its gait was slow and cautious,

and the animal frequently reared itself on its tail and hind legs, as if to listen more attentively. In this posture it would remain either erect or at any angle with the ground, and nothing could give a clearer idea of the almost supernatural strength of the muscles of the back and loins, than the perfect ease with which the position was assumed and retained, a strength only equalled, in the animal world, by those species of caterpillars, well known to Entomologists, which sustain themselves for hours in attitudes which no other animal could endure

for more than a few seconds. The annex-

ed diagram will give some idea of this fact. The animal appears to be in an unnatural position, out of balance, and

as if about to fall forward, but such is not the case, and the attitude here

sketched is one I have often seen it assume, and sustain without the slightest apparent effort. On one occasion, while stumping about the room, the *Manis* passing under a heavy bookstand, containing four large shelves filled with books, (a weight which I do not think two stout men could have lifted off the ground,) tilted the whole affair up, so as to cause a general rush to the spot, to avert the threatened overthrow! Being left to itself in a large room, but precluded from going out, it made several tours of the apartment, and at length throwing itself on one side, commenced excavating into the wall, which was of sun-dried bricks, and in about two minutes had dug out a hole large enough to cover itself. In doing this it disturbed a colony of white ants, whose galleries ran along under the plaister, but I could not perceive that it paid them the least attention. It being impossible to chain the animal, as it suffered nothing to touch its head, I kept it shut up in an empty beer-chest, the lid of which was rendered (as I imagined) secure, by large stones heaped upon it, to the amount of four or five maunds. In this manner I kept the animal about a week, during which it got pretty tame, seldom rolling itself up when touched or patted. It drank water freely at all hours of the day, lapping it up with its long tongue, and seemed fond of lying in it; but it took no food of any kind. Earth-worms, larva of kinds, and white ants were equally unnoticed; yet the animal appeared in no way weakened or suffering from hunger; and its weight, which was very

great, remain apparently undiminished. At last one night, it tossed off the ponderous lid placed on its box and made its escape, no traces of it being discoverable the next morning.

The second specimen I had in my possession, and which furnished the description here given, was brought me by some Koles in March 1842. It had been caught on a hill, at some distance from Chybasa, and in the midst of jungles. I had not unfortunately any opportunity of enquiring into the particulars of its capture. As I was then just about to leave Chybasa, I had it put into a box, and carried banghy fashion, along with my petarahs. During a three days' journey, it refused to eat anything, like its predecessor, but drank water. About the fourth day it began to grow more and more lethargic, remaining doubled up in its usual posture of repose. It was placed at night on a white ant hill; and at other times, black ants and larvæ were placed before it, but it refused nourishment, and after much protracted suffering, died during the night of the fifth day. Its tongue, which appeared paralyzed, remained protruded for the last 20 or 24 hours, till the end had become dry and shrivelled up. On being opened, there were found, as has been before related, swarms of intestinal worms in the stomach, which, and not starvation, might perhaps have caused its death, for there was a quantity of the remains of ants in the stomach, and the rectum was full of feces. One hind foot of the animal had also been cut off, but the wound appeared an old one, though it still smelt offensively. The whole body, especially on the soft skin underneath, and between the scales, was covered with disgusting swarms of ticks, and the animal was altogether filthy in the extreme. Both these specimens (of which the first mentioned was much smaller) were perfectly gentle and harmless. The former one would when handled, hiss like a snake, and this was the only sound I ever heard either of them emit. They slept rolled up in a ball.

One of these animals, in the possession of Captain Hannington, Assistant to the Governor-General, South-west Frontier at Poorulia, that gentleman described as having been much larger than mine, and of a clear whitish colour. It also was never observed to eat any thing, although allowed to ramble about the garden, (under surveillance,) and eventually made its escape, which it effected, (curious to say,) in the same way, and under the same circumstances as did the first animal, above alluded to.

Hindoos ascribe great virtues to the scales of these animals in the cure of Hoemorrhoides, but how they are applied I know not.

The subject of these notes I had the honor to present to the Society's Museum on my arrival in Calcutta. And a few days ago while visiting the Museum, had an opportunity of seeing the skin of a specimen agreeing apparently with the animal described to me by Captain Hannyngton. In this skin, there is a slight variety or modification of form in the shape of the lateral scales of the tail, sufficient perhaps, (if established by an examination of two or three more specimens,) to constitute a new species. Mr. Blyth, the Curator, who brought this fact to my notice, will have, it is to be hoped, the opportunity of being able by and bye to examine more specimens of the kind, and thus establish a new species, or reject a mere accidental variety. The one I have been describing, I see no reason to suppose other than the *Manis Pentadactyla*, or *Crassicaudata* of authors.

*Calcutta, April 16, 1842.*

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*On the Theory of Angular Geometry.* By S. G. TOLLEMACHE  
HEATLY, Esq.

The following paper is intended to examine the properties of angular magnitude in a light, which has not hitherto attracted sufficient attention.

It is usual among elementary writers, to express the fundamental idea of an angle by the phrase—"mutual inclination of its containing lines." These are the words of Laplace in his *Leçons* at the *Ecole Normale*, and are in substance those of the great majority of Geometers before and after him. When, nevertheless, we have to eliminate any property relative to angles, it is well known that this definition becomes a dead letter; and it is found necessary to superadd an explanation which embodies as much more of the fundamental idea, as enables us to compare angles together. It amounts usually to saying, that angles are compared with each other by comparing the openings at their vertices: and that the magnitude of an angle depends on the *width*, and not on the *longitudinal extension* of that opening, if it may be permitted so to use the words in italics.

An advanced student, who has acquired the idea in question, will find nothing very objectionable in thus expressing himself, for he knows what is to be described, and mentally assigns a due scientific meaning to the general term of common parlance. But to the beginner, there appears something as vague in the word "inclination," as in the term "direction," when applied to a straight line. It even appears more vague, for the genus of a straight line is given—it is the *line* of direction: but the angle, is it then inclination itself? The student is apprised, that his attention is to be confined to points, lines, surfaces, and solids, things of which he has definite conceptions: but here at the very outset is a subject introduced, which appears to be distinct from all, and to be a *quality* of figure rather than an existence. It afterwards turns out that the only practically useful explanation relative to an angle requires merely, that it should *measure* this quality of position.

Considerations of this nature have induced some distinguishedly successful elementary writers, to deviate from the usual custom in seeking for such a definition of an angle as should appear to be a natural description of it, to be free from metaphysical objections, and to permit of *immediate* use in the investigation of the properties of angles, or failing that, through medium of such simple considerations as may appear almost axiomatically deducible from the definition.

Of this class is Bossat's statement, that the angle is the opening between two lines, with an explanation impressing the definiteness of the conception, and the mode of comparison naturally resulting from it. This was followed by Professor Young in England. But the nature of the idea thus attempted to be expressed by the word opening, did not seem to be yet satisfactorily developed, and Legendre, accordingly ventured to substitute "quantity" for "opening." The American edition of Brewster's translation calls an angle, "the quantity by which two intersecting lines are separated from each other;" and Francoeur, I presume after Legendre, adopts a similar definition in his admirable *course*. It is, however, easily seen, that very little is gained by this step, on the score of clearness or precision, as the *kind* of quantity is not specified.

Leslie attempted quite another path, suggested by the correlations of angles and arcs; viz., that angular magnitude is generated by the revolution of a line round a fixed point: but we are not told what angular

magnitude is. All these definitions then fail in strictly fulfilling their object. Each has been in turn severely criticised by following reviewers anxious to establish the validity of the most infallible of all—their own. But all agree in this; that they are descriptions of different characteristics of the same idea. If from any one we can obtain a definite conception of what is intended, we immediately perceive that all are sufficiently correct to recall it to our minds. All agree in understanding angular quantity to be “something,” or if the expression be too bold, “that” which lies between two intersecting straight lines. All of them agree further in considering, that for purposes of comparison as to magnitude, angles must be estimated crossways, or by the width between the lines, and not with any reference whatever to the longitudinal extension in the direction of the sides.

Now, if we analyse the various definitions of an angle in this manner, it is, I think, impossible to come to any other conclusion than that an angle is the plane surface between two lines; of a peculiar nature, partly bounded and partly unlimited, whose value could consequently be only estimated by reference to the bounded direction, that is, the width between the sides. And the neatest and shortest mode of expressing this will apparently best solve our difficulty, as it connects axomatically an explicit definition with the working one.

The first place in which I believe this idea was embodied, was Bertrand's celebrated solution of the difficulty in the theory of parallels. The principle of that demonstration is as follows: Any angle, however small, can by repeated reduplication be made to exceed any given angle, however great, but the band of *unlimited space* between two parallel lines, though repeated ever so often, will never fill up that given angle. Hence an inter-parallel space is less than any assignable angle in value, and therefore a line which cuts one of two parallels, must also cut the other, otherwise the angle which it makes with the one it does cut, would be wholly contained within the inter-parallel space, and be less than it. The stress of this demonstration evidently rests on the comparison of surfaces, and it is surprising that its extreme elegance did not lead Geometers earlier to seek the solution of the problem in that direction. The truth is, that the new “unlimited spaces” were treated as interlopers in the science of figure, and the demonstration rejected, as “wearing only the semblance of geometrical accuracy.”

In Col. Peyronnet Thomson's\* *Geometry without Axioms*, these unlimited spaces are for the first time distinctly enunciated. The fourth edition of that work contains the following paragraphs :—

“ The latest innovation has been the assertion, that an angle (or the thing spoken of by Geometers under that item, whether they knew it or not) is a plane surface.” Pref. page x.

“ The plane surface (of unlimited extent in some directions, but limited in others) passed over by the radius vectus in travelling from one of the divergent straight lines to the other, is called the angle between them.” “ Hence,” adds the Colonel, “ angles are compared together by their extension sideways only, without reference to the greater or smaller length of the straight lines between which they lie.”

After making this decided step however, Colonel Thomson stops ; the definition is registered in his *Book of Nomenclature*, but he establishes the properties of angles by the old criterion of supposition. Not only indeed does the definition remain a dead letter, but the gallant radical reformer in Geometry as in Politics,

“ Astonished at the sound himself had made,”

virtually doubts its correctness, when at page 14, reviewing the proof of M. Bertrand, he says, “ All references to the equality of magnitude of infinite areas are intrinsically paralogisms.”

The edition in question of “ *Geometry without Axioms*,” was reviewed in the 13th No. of the *Journal of Education*, in an article which betrays the sparkling pen of Professor De Morgan. The part relative to angles is noticed thus : “ His is the first work, which we know, in which this idea (that of a plane surface) is fairly brought before the beginner. We suspect he is quite right, and that in the extension of the term *equal* to unlimited figures which coincide in all their parts, will be found the ultimate resting point of the theory of parallels. Had our author stuck close to his definition, the demonstration of Euclid's axiom given by M. Bertrand, ought to have been sufficient.” After noticing the neglect of Colonel Thompson to make any use of his definition, as well as his attack on unlimited spaces, the reviewer proceeds : “ We wonder therefore that the definition should have been inserted, for it is in the definition only, and the difficulty which a beginner must find

\* The well known Editor of the *Westminster Review*, and author of the *Corn Law Catechism*.

“ in settling his ideas of greater, less, and equal on that definition, that  
 “ the whole objection to M. Bertrand’s demonstration turns.”

I have been minute in these quotations, not only because they contain all that to my knowledge has been developed on a very interesting subject, but also in the hope that they may draw further attention. Led independently to similar conclusions, by attempting to trace the natural affinities, if we may so term it, of geometrical truths, with the intention of forming a definite arrangement of them, I was induced to trace their consequences in establishing the various relations of angular space. The results of the inquiry may be thrown into a connected chain of propositions, as subjoined.

*Definition 1.*—The plane surface between two straight lines, bounded in the one direction, unlimited in the other,—is called an *angular space*.

*Definition 2.*—When an angular space is bounded on one side by the intersection of the containing lines, it is called an *angle*.

*Definition 3.*—The point of intersection is called the *vertex*, and the containing lines are called the *sides* of the angle.

*Axiom.*—From the definition, it will follow that two angular spaces  $A B C D$ , and  $E F G H$ , must be compared thus : If placing the line  $F E$  on  $B A$ , we find that,  $F$  falling on the point  $P$ ,  $G$  will fall on some point  $Q$  in  $C D$ , then according as the line  $G H$  falls within, upon or without the line  $C D$ —is the angular space  $A B C D$ , greater than, equal to, or less the angular space  $E F G H$ . (Fig. 1.)

*Definition 4, 5, 6.*—Euclid’s definitions of right, acute, and obtuse angles.

### *Proposition I.*

Every angular space is equivalent to its angle.

This follows from the axiom, since the sides of the angular space, and of the angle are identical, and may therefore be considered to coincide.

### *Proposition II. (Fig. 2.)*

All right angles are equal to one another.

Let the right angles  $A B C$ ,  $E F G$ , be made respectively by  $A B$  with  $B C$  and  $E F$  with  $F G$ ; they are equal. Produce  $C B$  to  $D$  and  $F G$  to  $H$ , and apply the figures one to the other, so as to make  $F$  coincide with  $B$  and  $G H$  with  $C D$ . If then  $F E$  do not coincide with  $B A$ , let it fall



as  $BK$ . Then  $GFE = CBK < CBA < (\text{its} = ) ABD < KBD < EFH$ .

But  $GFE = EFH$  by definition, hence the supposition, that  $FE$  does not coincide with  $BA$  involves absurd consequences,  $\therefore FE$  does coincide with  $BA$ , and  $GFE$  with  $CBA$ ,  $GFE$  is therefore equal to  $CBA$ .

*Cor. 1.*—A right angle is therefore a *constant* in angular magnitude.

*Cor. 2.*—The space on one side of a straight line, considered as an angle at some given point in the line, is two right angles.

*Scholium. (Fig. 3.)*

Consider a line  $OA$  fixed, and another line  $OR$ , having a point  $O$  in common with  $OA$ , but being itself in a state of rotation round  $O$ . When in the position  $OR$ , it will have generated an acute angle  $AOB$ : as it proceeds, it will coincide with the perpendicular  $OB$ , and will have described a right angle. In the position  $OR_2$ , the angle generated is an obtuse one. The generating line then coincides in its progress with  $OC$ , the continuation of  $OA$ . It will in such position have described two right angles ( $AOB$  and  $BOC$ ). Supposing the rotation to continue,  $OR$  will fall below  $OC$ , as  $OR_3$ , having described the whole of the coloured angular space, which is greater than two right angles. Such angle is called a *reverse* angle. During the progress of the line, the reverse angle continues to increase, equals 3 right angles, exceeds that amount, and at length equals 4 right angles, when  $OR$  has completed an entire circuit. By conceiving the line to move on, still revolving, and with the aid of a contrivance like the spiral twisted palm-leaf fans, used by the Natives, the beginner may obtain the idea of angles greater than four right angles, and generally of  $(2n\bar{n} + A)$  which some find it difficult to understand in their later trigonometrical studies, and perfect acquaintance with which is so indispensable to the comprehension of periodic functions.

*Proposition III. (Fig. 4.)*

The vertically opposite angles made by two intersecting straight lines, are equal to one another.

The vertically opposite angles  $AED$  and  $CEB$  made by the intersectors  $AB$  and  $CD$  at  $E$  are equal. For  $CED$  being a straight line, the angular space on the side of it towards  $A$  is two right angles. For

a similar reason, the space on that side of  $AEB$  towards  $C$  is equal to two right angles. These two angular spaces being constantly equal, take away from both the common angular space  $AEC$ , therefore the remainders are equal, viz. the angles  $AED$  and  $CEB$ .

*Scholium.*

It may be useful to devote an angular space by *two* letters, one from each side, if the angle be less than two right angles, or by *three* if the angle be two right angles or more, to prevent the confusion of direct and reverse angles. Thus in Fig. 4,  $CEB$  would stand for the angular space corresponding to  $CEB$ ;  $ACB$  for the two right angles between  $EA$  and  $EB$ : and  $DACB$  for the reverse angular space between  $ED$  and  $EB$ . The demonstration of III may then be made shorter, and perhaps clearer, thus:  $CED$  being a straight line,  $DAC = 2$  right angles; also because  $AEB$  is straight,  $ACB = 2$  right angles. Hence  $DAC = ACB$ ; take away the common part  $AC$ , then  $AD = CB$ . that is the angle  $AED = CEB$ .

*Proposition IV. (Fig. 5.)*

If the angle contained by two straight lines is equal to two right angles, those straight lines form but one continued line.

For if  $AB, AC$  including an angle equal to two right angles, are not in the same straight line, let  $AD$  be the continuation of  $AB$ : then  $DCB$  is two right angles, but  $CEB$  is the same by hypothesis,  $\therefore DCB = CEB$  an absurd result; therefore  $AC$  and  $AB$  form but one line.

*Proposition V. (Fig. 6.)*

If any number of straight lines tend towards the same parts, the angle made by the extremes is equal to the sum of the angles made by the successive pairs of lines.

Let  $A, B, C$  and  $D$  be straight lines, tending towards the same parts, then the angle  $AHD$  is equal to the sum of the angles  $AEB, BFC, CGD$  formed by the successive pairs of lines. For the angular space  $ABCD$  is equal to the sum of the three angular spaces  $AB, BC$  and  $CD$ . But  $ABCD$  is the angle  $AHD$  and the constituent angular spaces  $AB, BC, CD$  are respectively identical with the angles  $AEB, BFC, CGD$ . Hence  $AHD = AEB + BFC + CGD$ .

*Proposition VI. (Fig. 7.)*

The three angles of a triangle are together equal to two right angles.

Let  $ABC$  be the triangle, produce  $AB$ ,  $AC$  to  $E$  and  $F$  and the base  $BC$  both ways to  $D$  and  $G$ . Then since the lines  $DB$ ,  $EB$ ,  $FC$ ,  $GC$  all tend towards the same parts, the angular space  $DEFG = DE + EF + FG$ . But  $DE$  is the angle  $DBE$  or its vertically opposite  $ABC$ ;  $EF$  corresponds to the angle  $BAC$  and  $FG$  is the angle  $GCF$  or  $ACB$ . Also  $DEFG$  is the angular space contained by two portions of the same straight line, it is therefore two right angles. Hence

$$ABC + BAC + BCA = 2 \text{ right angles.}$$

*Cor. 1.*—The exterior angle is equal to the two interior and opposite on the same side, proved by reversing the process of Euclid in the 32. I. or as well thus (see *Fig. 7.*) The angular space  $EG$  is equal to  $EF$  and  $FG$ :  $EG = EBG$ ;  $EF = BAC$  and  $FG = FCG = ACB$   
 $\therefore GBE = BAC + ACB$ .

*Cor. 2.*—Euc. I. 16 and 17 are further contained in the last corollary.

*Proposition VII. (Fig. 8.)*

The interior angle of a polygon of  $n$  sides are together equal to  $(2n - 4)$  right angles.

Let  $ABCDEF$  be the polygon; subdivide it into triangles by lines from one of the points  $A$ . Then the angles of the polygon are equal to the angles of the triangle taken together. Each of the polygon, *save the two meeting in  $A$* , corresponds to one of these triangles, therefore the number of triangles, is  $n - 2$ . And the sum of the angles in each is 2 right angles,  $\therefore$  the sum of all the angles is  $(n - 2) \times 2$  right angles. That is,  $(2n - 4)$  right angles. Hence the angles of the polygon are equal to  $(2n - 4)$  right angles.

*Proposition VIII. (Fig. 9.)*

The exterior angles of a polygon, whatever be the number of sides, are together equal to 4 right angles.

The whole angular space  $FGHKL F$  is composed of the angular spaces  $FG$ ,  $GH$ ,  $HK$ ,  $KL$ ,  $LF$ . But the whole space  $FGHKL F$  is the entire angular space on both sides of the line  $FE$ , i. e. 4 right angles, and each of the constituent angular spaces corresponds to an

exterior angle of the polygon. Hence the exterior angles together amount to 4 right angles.

The above eight Propositions comprise all the properties of intersecting lines which are independent of the consideration of *length* and *size*. They shew how possible it is to translate the *spirit* of the principle of homogeneity from analytical into geometrical inquiries; for our *results* being altogether free from the comparison of triangles or the length of lines, the interweaving of those subjects in our *processes* raises a suspicion, that we are not proceeding so simply as we might do, but are embarrassed with matters really foreign to the direct truth. We might extend the same course to parallel lines.

*Definition.*—Straight lines that never intersect each other, are called parallel lines.

*Proposition IX. (Fig. 10.)*

If a straight line meet two others, so as to make the exterior angle equal to the interior and opposite on the same side, these two others shall be parallel.

Let  $CBE$  meet  $AB$  and  $DE$  making  $ABC = DEB$ , then  $DE$  must be parallel to  $AB$ . For the angular space  $DC = DA + AC$  and  $DC$  is  $DEC$ , and  $AC$  is  $ABC$ ,

$$\therefore DEC = DA + ABC, \text{ but } DED = ABC.$$

$\therefore DA$  is zero, or  $DE$  and  $AB$  contain no angle, therefore they never meet, for if they met, they must contain an angle; hence they are parallel.

*Cor.*—This proposition proves the possible existence of parallels.

*Proposition X. (Fig. 10.)*

If a straight cuts a pair of parallels, it makes an exterior angle equal to an interior and opposite one on the same side.

For as before  $DA C = DA + AC$ , but since  $DE$  and  $AB$  never meet, they contain no angle, i. e.  $DA$  is zero; hence  $DA C = AC$  or the angle  $DEB = ABC$ .

*Cor.*—It would be a waste of space to deduce from this, the other usual properties of parallels.

*Proposition XI. (Fig. 12.)*

Straight lines parallel to the same are parallel to each other.

A and B being each parallel to C, B is parallel to A. For  $AC = AB + BC$ , but AC and BC are each a zero,  $\therefore$  AB is also zero, or B parallel to C.

*Proposition XII. (Fig. 13.)*

If a straight line cut one of two parallels, it must cut the other.

AC, meeting AB, not meet its parallel GD, parallel to ED, consequently AC, AB being both parallel to ED, are parallel *inter se*, which is not the case.

The only other property of parallel lines not included in the above is, that two straight lines which are respectively parallel to two others contain an angle equal to the angle of those others. But there is nothing peculiar in its demonstration. These thirteen propositions contain a complete and homogenous *geometry of position* as contra-distinguished from that of *magnitude*: I speak of course relatively to lines. It is scarcely necessary to refer the student to the Third Book of Euclid, as far as relates to the consideration of angles in a circle, to shew how much this mode of treatment, and the introduction of reverse angles would simplify the subject, as well as prepare him for analytical inquiries by generalising his ideas on it.

POSTSCRIPT.

In looking over some of the mathematical articles of the Penny Cyclopaedia, written by Professor De Morgan, I have subsequently to the writing of the above, found a confirmation of my views as to the nature of the angle under the heads, "Angle" and "Infinite."

The former proposes to introduce the axiom, that "two spaces whether of finite or infinite extent are equal, when one can be placed upon the other, so that the two shall coincide in all their parts." After which it is remarked, that Bertrand's demonstration becomes rigorous. This also considers an interparallel space viewed as an angle to be zero, as I have done, since it is less than any assignable angle.

The latter has the following passage:—

"The comparison of such infinite spaces is therefore possible, consistently with perfect clearness in the meaning of the terms employed, and a simplicity of reasoning which would convince any one who is capable of the most ordinary thought. Had Euclid been accustomed

“ to the modes of thinking which involve the idea of infinite magnitude  
 “ under any form whatsoever, it may be reasonably suspected that he  
 “ would admit the following axiom, *Magnitudes which can be made to*  
 “ *coincide in all their parts are equal*, as applicable to infinite as well as to  
 “ finite spaces. Not having done so, the adherence to his standard has  
 “ to this day excluded the only proof of the theory of parallels, which  
 “ does not assume the axiom of Euclid, or an equivalent.”

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*Remarks on the Essay “ on the Theory of Angular Geometry.” By Capt.*  
 SHORTEDE.

A definition is perfect, when it includes all that has the property intended to be defined, while it excludes all that has it not.

If we would have a true definition of *angle*, or of any thing else, it is of the utmost importance that we have a clear idea of the thing, and then use such words as plainly to convey the idea. If there be any neglect in either of these, our definition must necessarily be imperfect.

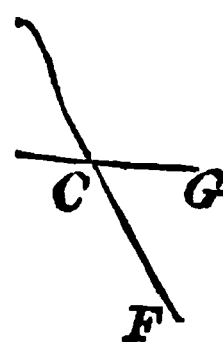
Geometry as commonly defined, treats of *figured space*. If this definition be correct, (and I find no fault with it), then it is plainly improper to introduce indefiniteness, or boundlessness, or infinity, as part and parcel of the definition of a thing or idea, of which the property signified by these terms, is not *necessarily* a part. I can conceive of an angle formed by finite lines: unboundedness is therefore not necessary to the *idea* of angle, and therefore ought not to form a part of the *definition*.

Since the idea of *angle* is somehow sooner or later convertible to, and commensurable by that of *circular arc*, every attempt at defining angle should be made with this in view, otherwise the definer will discover, (or some one will discover it for him), that his definition is not perfect.

As the author of this Essay introduces unlimitedness in the containing lines as part of his definition of *angle*, I do not see why the plane surface of a hyperbola between its asymptotes may not be angle, as well as the thing intended by him. If it be said, the meaning is the *whole* plane surface between the lines, I rejoin that the *whole* plane surface being unlimited, I cannot form an idea of how much it is.

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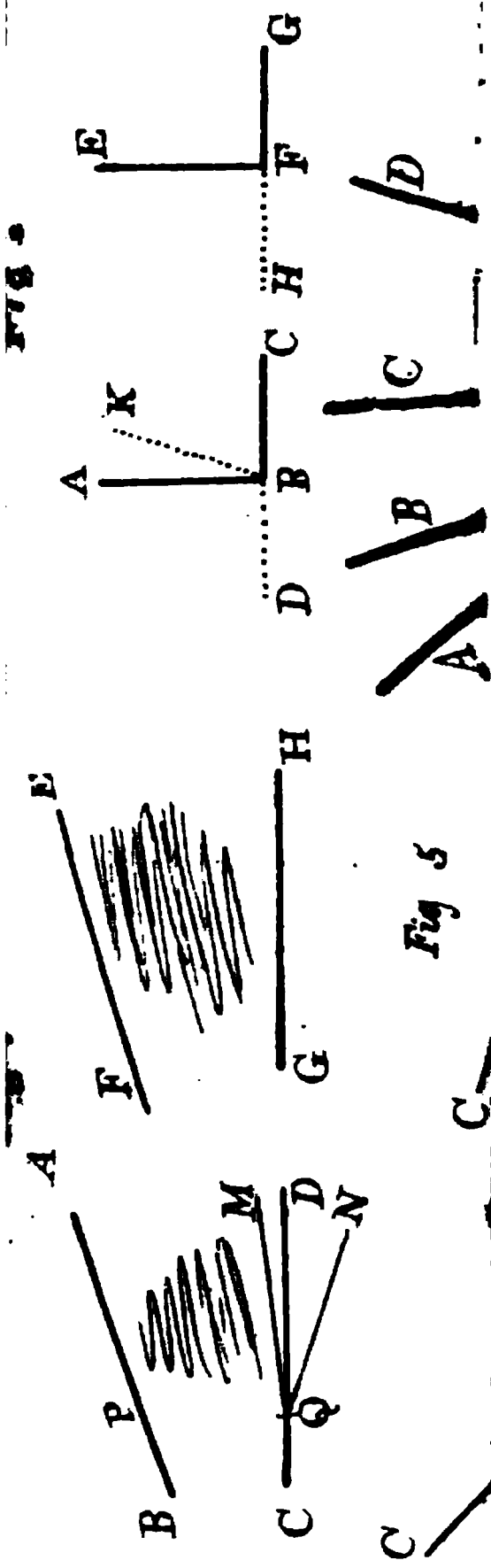


Fig. 3

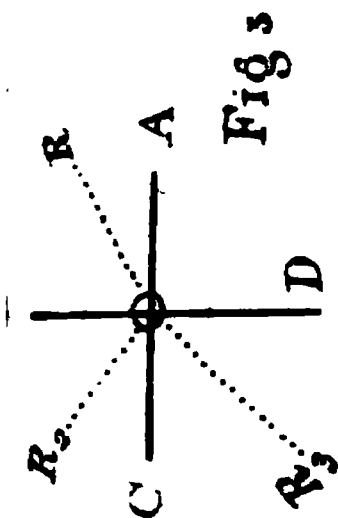


Fig. 5



good map, shewing not merely one high road through the country, but also the principal cross-roads connecting the different parts of the country with each other. In point of fact, no one is considered to be master of the subject, till he be pretty fully acquainted with these cross-connections.

We may chop logic as long as we please, but after all there is precisely the same difficulty in conceiving straight lines to be lengthened by producing them, as in conceiving angles to be increased by the continued revolution of one of the sides about a point, or by the lengthening of the circular arc measuring them. Each is accomplished by motion. The straight line is produced by another straight line laid partly upon it, and partly beyond it, or by conceiving the line to move along itself, all points between the fore-end of the old line, and the rear end of the new being common to both lines. In like manner, an angle or circular arc is increased either by a line revolving about a point, or by conceiving the arc to move upon itself, so as to have all the points between the fore-end of the old arc, and the rear end of the new arc, common to both arcs. In this way the idea of a fixed centre is unnecessary for any but the first part of the arc, just as the idea of a fixed direction is unnecessary for any but the first part of the straight line.

*Notes on the Recent Earthquakes on the North-Western Frontier.* By  
Lieutenant R. BAIRD SMITH, Bengal Engineers.

On the forenoon of Saturday, the 19th of February 1842, a severe shock of an Earthquake was experienced at different points in the countries on our North-Western Frontier, and extending thence is affected, although with much reduced intensity, several of the districts of the North-Western Provinces.

The remotest point at which its devastating influence was experienced, and relative to which any authentic intelligence has yet reached us, was the city of Jellalabad, where extensive injury was done to the fortifications and to the buildings throughout the place. The motion of the earth is described as having been of an undulating character producing symptoms similar to those of sea-sickness in many of the persons who felt it; and in one account it is asserted, that the ground opened and closed again with loud noise in several places. Such



phenomenon is a very common accompaniment of a severe Earthquake, and by the extent to which it occasionally reaches, has proved one of the most fatal causes of destruction to life and property. The details of the effect of the Earthquake at Jellalabad are very brief and imperfect; this is, however, simply what might have been anticipated from the circumstances under which the gallant force now there are placed, but we shall probably at a future time obtain information of a more definite and satisfactory character. Three bastions, with, I presume, their connecting curtains, are said to have been levelled with the ground, and a painful interest is attached to this particular effect of the shock, from its having thrown open the defences of the small but resolute body of troops then occupying the city, and exposing them to an assault from the Affghans, at a time when they must necessarily have had much internal confusion to contend against. In darker times, superstition would have tended to unnerve still more our brave friends, but on this occasion their courage appears to have risen even above the level of their difficulties, and brilliant success in repelling the assault was no more than the well-merited reward of their devotedness and energy.

From Jellalabad the shock affecting a portion of the Suffied Koh range of mountains, with the numerous subordinate ranges that diverge from these, reached Peshawur. From the circumstance of General Pollock's force being encamped at Kawulsur, about eight miles from Peshawur, and the communication being uninterrupted, our details are much fuller, and more satisfactory, than would otherwise have been the case.

The following extracts from letters published in the *Delhi Gazette*, give the most perfect account of the different effects of the Earthquake that I have been able to find, although it is much to be regretted, that on the most important point, that namely, of the exact time of the occurrence of the shock, much discrepancy exists.

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*Extract from a Letter, dated Kawulsur, 20th February, 1842.*

"Yesterday a fearful Earthquake visited this part of the world. The shock, which came on between 10 and 11 o'clock was long continued, and men, horses, tents, even the ground under us, and the hills in the

distance, appeared to be moving. It was an awful visitation, and made every heart quake. In the direction of Peshawur, (eight miles distant,) clouds of dust appeared, which proved to have been caused by the falling of very many houses and buildings. A salute was fired from the battery at Jumrood, for the purpose of announcing the safety of Rajah Pertaub Sing, son of Maharajah Shere Sing, who is now at Peshawur, and of whom it is said, he narrowly escaped death; the building in which he had been sitting, came down almost immediately after he quitted it. The natives say, that a tenth of the city is down, and a number of the inhabitants killed."

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*Extract from a Letter, dated Kawulsur, 19th February, 1842.*

"It is now about 12 o'clock mid-day, and we have just experienced a most awful Earthquake in camp. The natives say, that nothing so severe of the kind has been experienced in India for the last fifty years. The earth literally trembled like an aspen leaf, and rocked to and fro as an infant's cradle, or a ship at sea. Many of the camels that were carrying the baggage of the troops moving up to Colonel Wild's camp were thrown down, and so great was the shock, *which lasted fully five minutes*, that I was obliged to support myself by holding on to the camp furniture, and many of the officers fancied themselves suddenly taken ill. I expected every moment to have seen the earth open and swallow us up, and it is only by God's great and merciful providence, that we have escaped through such an awful convulsion of nature.

"Every one complains of nausea. We have just been observing immense volumes of dust, that completely darken the atmosphere in the direction of the old rickety town of Peshawur, which is supposed to be nearly levelled with the ground, as the houses are but weakly built, being merely propped up by the beams of wood which may be observed placed in different spots under large walls and corners of the houses, and are even dangerous to passers-by at all times. I doubt not but that to-morrow's dawn will bring us dreadful intelligence, and produce a fearful account of lives lost.

20th February.—"Reports say, that only from 40 to 50 of the inhabitants of Peshawur were crushed and killed among the ruins of the falling houses. General Avitabile's large dwelling house, which had

recently been built, and was being finished, fell in, but luckily it did no injury to any one living in the house."

It will be observed, that the writers of these interesting letters differ at least an hour and a half, or two hours in their estimates of the time at which the shock was felt at Kawulsur, the first placing it between 10 and 11 A. M., the other at noon. By comparing the periods of the occurrence at stations farther removed from the focus of disturbance, as at Delhi, Poojnah on the Doab Canal, Saharunpore, and other places, to which more specific reference will immediately be made, I am disposed to consider the first of these estimates as the most correct, and to fix the period of the shock at Kawulsur at very little after 10 A. M.

Travelling in an easterly direction, the next notices we have of the Earthquake is its being felt at Delhi, where its period appears from all accounts to have been about 10 minutes past 11 A. M. On reaching Delhi, both the intensity of the shock, and the rate of propagation of the undulations seem to have materially diminished; and beyond the motion of the ground, no other effects are alluded to.

Still continuing easterly, and in a direction very little removed from a right line between the two places, the shock travelled from Delhi to Poojnah, a station on the Doab Canal, where its effects were observed by Serjeant and Assistant Overseer J. R. Renny, and the following details connected with them were forwarded by him to me.

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*Extract of a Letter from Serjeant Renny, dated Poojnah, 19th  
February, 1842.*

"I also beg leave to inform you, that we felt a very severe shock of an Earthquake here at about half-past 11 A. M., it lasted *about three minutes* with intervals. My whole family felt it, as well as the people about my place, who came running to me much alarmed. It was first noticed, I believe by myself, as I was then sitting writing, and found a heavy table on which my desk was laid, much agitated, which I thought was caused by some one moving, but I soon found my chair in motion also, and on looking about, I perceived every thing moveable in the room in a state of agitation. A few hours before

this, I observed the water in the Canal was unusually muddy, and after the shock was over I went to look, and found the water much disturbed by a high swell, whether occasioned by the shock or not, I cannot say."

These details are unusually complete and interesting, and are very creditable to Serjeant Renny's powers of observation. The unusual muddiness of the Canal cannot possibly be due to the influence of the Earthquake, since the direction in which the shock travelled was against, not coincident with that of the current in the Canal, hence the disturbance of the silt in the bed could not *precede* the shock; but it is quite possible, that the high swell observed *after the shock had passed*, may have been occasioned by it. The muddiness was probably caused by a fall of rain in the upper part of the Canal.

From Poojnah the shock travelled to Saharunpore, where it was just felt, but attracted no particular attention. It was next experienced at Kulsea, another station on the Doab Canal, fourteen miles to the northward of Saharunpore, where its effects were very perceptible. The motion here, as described to me by Mr. Sub-Conductor Pigott, was of the same undulating character as at Kawulsur, but its duration was certainly not more than a minute. Immediately on observing the shock, Mr. Pigott ran to the sun-dial, and found it precisely noon, or 12 o'clock. My camp was pitched about two miles north of Kulsea, on the south bank of the Nowgong Row, (or Stream,) but so feeble was the intensity of the shock, that although I was conscious of some peculiar motion at the time, it never occurred to me that it arose from an Earthquake, and it had passed from my mind, till recalled by Mr. Pigott's account of what had been felt at the same time at Kulsea.

By combining the preceding details, some interesting points may be determined; and first, as to the rate of progression of the undulations. The maps I have had it in my power to consult, were not all so good as I could have wished, and the distances mentioned may possibly be a little incorrect, but not so, I believe, to any great extent. From Jellalabad to Peshawur, measuring in a straight line across the spur of the Suffied Koh, the distance is 70 miles. From Peshawur to Ferozepore, measuring similarly in a straight line, the distance is 280 miles, and from Ferozepore to Delhi 250, in all 600 miles. The period of the shock at Jellalabad is not mentioned, but at Peshawur

it may be taken at 10 A. M., while at Delhi it was 10 minutes past 11 A. M., hence then 530 miles were traversed in 1 hour and 10 minutes, or the shock travelled at a rate of 7.571 miles per minute, or 454.26 miles per hour. This, it is to be observed, is an average rate, and the velocity at Jellalabad and Peshawur was doubtless much greater, but a much more multiplied series of intermediate observations than we now have, would be necessary to enable us to form even an approximate idea of the law of decrement of rate of progress with reference to distance travelled. From Delhi to Poojnah is about 50 miles, and the times consumed in travelling from the one place to the other was 20 minutes, consequently the velocity of the shock was 150 miles per hour. Again, the distance from Poojnah to Kulsea is very nearly 36 miles, and the time 30 minutes, so that the velocity had diminished to 72 miles per hour, supposing the times to have been correctly observed, which, within a small limit, was probably the case. Hence then we have,

*Miles.*

Rate of progress of shock from Peshawur to Delhi, 454.26 per hour.

„ „ from Delhi to Poojnah, 150 ditto.

„ „ from Poojnah to Kulsea, 72 ditto.

We may next attempt to form some estimate of the breadth of the undulations, of which there appear to have been several, although no data are furnished, from which we can learn either their number or individual extent. We must therefore content ourselves with estimating the total breadth of the zone of disturbance, as it may be called, at different points.

The duration of the shock at Kawulsur is said to have been 5 minutes, and supposing the velocity to have been there twice the average between Peshawur and Delhi, or 15.142 miles per minute, the breadth of the disturbed zone would be 75.71 miles, or in five minutes, a series of terrestrial waves, whose united breadth was this number of miles swept past Kawulsur. This is a horizontal measurement; but of the vertical height of the waves, on which their destructive influence chiefly depends, we can form no estimate, yet it must have been considerable, if we may judge from the ruin caused.

At Poojnah, the duration of the shock was considered to be three minutes, the velocity 2.5 miles per minute, and therefore the breadth of the disturbed zone was here 7 miles. While again at Kulsea, where

the duration was one minute and the velocity 1.44 miles per minute, the breadth was 1.44 miles.

Whence we have,

*Miles.*

Breadth of zone of disturbance at Kawulsur,	75.71
„ „ „ at Poojnah	7.00
„ „ „ at Kulsea,	1.44

Whatever may be the effective cause of Earthquakes, whether undulatory motion communicated to internal masses of fluid matter, and from thence communicated to the super-imposed crust of the earth, or vibrations propagated from foci of disturbance through the solid crust itself, or a combination, as some facts would intimate of both these causes, there are two modes in which we may conceive these motions to be spread abroad. First, they may proceed in gradually enlarging circles, (as when a stone is thrown into water,) the focus of disturbance being the common centre; or they may be propagated along a distinct and defined track, (as when a string or wire is seized at one extremity and motion communicated to the whole from this,) when the focus of disturbance would be at one end. In the first case we would expect the effects of the Earthquake to be felt at points equi-distant from the centre at times approximating, but not exactly coincident both with each other, as the rate of progress of the undulations would necessarily be affected by the nature of the rocky crust through which they were propagated. In the second case, we would expect, that while the effects of the shock were more or less severe within certain limits, beyond these limits none would be experienced. All the information I have been able to collect tends to shew, that the Earthquake of the 19th February 1842, belonged to this latter class, and if lines be drawn through Peshawur, Ferozepore, &c. with parallels through Jellalabad, which as yet forms the southern limit of the track, it will be found that the breadth of the district affected by the shock was somewhere about 40 miles, and in it are included the mountain ranges to the south, east, and west of Peshawur, with a considerable portion of what has been called the Salt range. This estimate has been formed solely from the facts collected by myself, and it may yet require to be much modified as our information extends. The method of what may be called the linear, in contradistinction to the circular propagations of Earthquake shocks, appears to me to lead very distinctly to the conclusion, that in

such cases, the original seat of the disturbing forces must necessarily fall short of the centre of the earth, and also be unconnected with any such continuous fluid nucleus, as many suppose to exist at no very great distance from the surface. When from the action of any disturbing cause, the equilibrium of a continuous fluid mass was deranged, the resulting motions would be communicated in all directions radiating from the point of original disturbance, and if this was near the centre of the earth, the movements ought to affect its whole surface, so that shocks would be experienced nearly simultaneously over the whole world. But however extensive may be the connection of certain Earthquakes on record, we have nothing approaching to any such universality of effect as this, and the theory of local action (using this expression in a large sense) appears to agree best with the present state of our knowledge relative to the phenomena of Earthquakes and their causes.

On the night of the 5th of March, 1842, another very severe shock was experienced, which appears to have been more limited in its range than the preceding, and exhibited essentially distinct phenomena. The motion in this instance, instead of being like the rounded swell of a fluid or viscid mass, was sharp and sudden, like the effect of a concussion, than of an undulation, and seemed indeed to be a much magnified "jarr," similar in kind to that experienced by the hand when a hammer held by it, is struck forcibly on a hard unyielding body. One intelligent friend, who was in his study when the shock occurred, described the effect to be, as if he and his chair had received a sudden and severe blow from behind, by which they were impelled forward, while to me, it seemed as if my chair had been suddenly lifted from the ground, and dashed down again with great force.

The following interesting detail of the effects of the shock, as experienced at Berkeri, a station on the Doab Canal, about 20 miles south of Saharunpore, was communicated to me by Serjeant and Overseer J. Petrie, to whom I feel much indebted for the trouble he has taken in preparing it.

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*Letter from Serjeant John Petrie, dated Berkeri, 5th March, 1842.*

SIR,—We had a very smart shock of an Earthquake here at 9 o'clock this evening ; so much so indeed, that every' thing in this bungalow shook and rattled again. I had just laid down to rest with a book

in my hand when it came on, and I started up and called out for assistance, thinking the house was coming down. Every one about the place felt it, and came running to me. I found that the south door of the inner room, which I had bolted before I went to bed, had been forced open by the bolt falling down. Indeed every thing in the house shook, and I was very much afraid of its falling, after having read the accounts from our Army near Peshawur. At that place, a number of houses have been destroyed, and many lives lost, from the last Earthquake.

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Although this shock did not last so long as the one of the 19th of last month, in my opinion it was much more severe for the time.

The rate of propagation of this shock appears to have been great, since no perceptible difference was observed in the times of its arrival at the following places: Simlah and Mussoorie in the Himalayas, Deyrah in the Deyrah Dhoon, Saharunpore, and Berkeri. There is, therefore, every reason to think, that on this occasion the shock was propagated after the circular method, as I have defined it above, and the nature of the shock appears to indicate, that the seat of the disturbing force was either within the rocky crust of the earth, or at a very small distance indeed beneath it. Such a supposition is necessary to account for the peculiar "jarring" sensation characteristic of this shock. Its effects appear to have been most severe at Deyrah, where a large house is said have been split from top to bottom, but no particulars of this accident have reached me. I am somewhat disposed to think that the actual force of disturbance was situated somewhere in the valley of Deyrah, and propagated thence to the hills on one side, and to the plains on the other; a more extensive collection of facts would however be necessary to give probability to this impression, and these have not in this instance been collected. It may be stated, however, that all who had experienced both shocks in this neighbourhood, concurred in opinion that they came in different directions, and as the first was from West to East, it is not impossible the second may have been from North to South. The southern door of the inner room of the Berkeri Canal bungalow, which is stated by Serjeant Petrie to have been driven open by the shock, would on the above supposition receive the first impulse, and the effect produced upon it, tends in some measure, to confirm



the view I have taken of the direction in which the shock was propagated.

The occurrence of Earthquakes throughout these provinces, and indeed throughout India generally, is so frequent, and their connection with geological theories of such an interesting character, that it is highly desirable to facilitate, as much as possible, the collection of minute, well authenticated, and carefully detailed facts relative to these various phenomena. I will therefore conclude this note, by pointing out briefly those points on which information is peculiarly desirable, and the attention of observers is earnestly solicited to them.

1. *The Time*.—The startling discrepancies that occur in regard to time, in otherwise most satisfactory accounts of Earthquakes, indicate the great necessity for precaution in observing it, since it is undoubtedly the point on which the most interesting conclusion relative to such occurrences must be based. When, therefore, the period of a shock is marked by a watch, means ought to be taken, whenever possible, to verify the time shewn by this watch, by some simple celestial observation, or some data should be given by which the time could be ascertained independently within very trifling limits, as for example, by a specification of the exact length of the shadow of a vertical object of fixed and determinate length, on a horizontal level, at a precise moment, not too near noon; or if near the coast or at sea, the first appearances and last disappearances of the sun's upper and lower border, above and below the sea horizon, etc.\* Without this minute identification of time, it is impossible to maintain the connection of shocks felt at far distant places; calculations of the rate of progress of the undulations or vibrations can only be approximative, and other interesting points are rendered inconclusive.

2. *The Duration*.—On this point also, the most striking discrepancies are to be observed, arising no doubt from each observer making his own sensation the measure of duration, and estimating the latter without reference to some determinate standard. When the mind is intently occupied either by feelings of alarm or intense interest, it is wholly unfitted for estimating duration correctly, and the watch ought only to be trusted. The general tendency is to make the duration

\* Sir J. Herschell's Meteorological Instruction, Prof. Papers, Roy. Engrs. vol. ii.

of shock longer than it really is, and in most instances, considerable deductions might with safety be made from recorded observations on this point, to bring them near the truth. The duration of intervals between shocks should also be carefully noted.

3. *Nature of the Shocks.*—This is very frequently twofold: one kind throws the crust of the earth into a tremulous state. This was the nature of the shock of the 19th February. The second kind is of the nature of a concussion or blow, and does not always occur. Sometimes both of these are conjoined in one and the same shock, and the latter is felt generally in the middle of the former.

4. *Nature of the motion on the Earth's surface.*—Three different varieties of this have been observed. First, a horizontal motion by which bodies are, as it were, pushed horizontally forward. Second, a vertical motion by which they are lifted up and dashed down again. The conjunction of these two kinds of motion produces the third, which is of an undulatory character, partaking both of the horizontal and vertical movements. This kind is the most frequent of all, and produces those sensations of nausea, so commonly alluded to.

5. *Rents in the ground and subsidencies* are very common accompaniments of Earthquakes, and their appearance ought to be represented on paper, and their dimensions carefully measured. These are often accompanied by *loud noises* of various kinds.

6. *Meteorological phenomena* are highly important, and some curious and interesting relations have been observed, between these and the occurrences of Earthquakes. This is especially true as regards the state of the barometer and thermometer, and the electric condition of the atmosphere. Such points therefore merit peculiar attention.

7. *Geological structure of affected District.*—When the observer is qualified to furnish information relative to this, his remarks will be additionally important, as it has been observed, that in localities exhibiting certain geological features, Earthquakes always occur with much greater frequency than in others. Wherever powerful and extensive volcanic action has occurred, where faults and fissures communicating with the internal seats of disturbing forces are found, there Earthquakes occur with greater frequency and higher intensity, and they are frequently observed to pursue a direction, parallel to that of the principal faults or fissures.

8. *The direction of the Shock.*—I am not aware of any instrument having yet been actually employed for ascertaining this point, but the following simple apparatus has been proposed for the purpose by Prof. Babbage, in his admirable little volume on the Economy of Manufactures and Machinery; and although it must be confessed, that several of the schemes he has proposed in that work, remind us a little of the designs of the sages in Swift's College of Laputa, this is not one of them, but seems adapted to its proposed object.

"An earthquake," he remarks "is a phenomena of such frequent occurrence, and so interesting both from its fearful devastations, as well as from its connexion with geological theories, that it became important to possess an instrument which shall, if possible, indicate the direction of a shock, as well as its intensity. An observation made a few years since at Odessa, after an Earthquake which happened during the night, suggests a simple instrument by which the direction of the shock may be determined.

"A glass vase, partly filled with water stood on the table of a room in a house at Odessa; and from the coldness of the glass, the inner part of the vessel above the water was coated with dew. Several very perceptible shocks of an Earthquake happened between three and four o'clock in the morning; and when the observer got up, he remarked that the dew was brushed off at two opposite sides of the glass, by a wave which the Earthquake had caused in the water. The line joining the two highest points of this wave, was of course that in which the shock travelled. This circumstance which was accidentally noticed by an Engineer at Odessa,\* suggests the plan of keeping, in countries subject to Earthquakes, glass vessels partly filled with treacle or some unctuous fluid, so that when any lateral motion is communicated to them from the earth, the adhesion of the liquid to the glass shall enable the observer, after some interval of time, to determine the direction of the shock.

"In order to obtain some measure of the vertical oscillation of the earth, a weight might be attached to a spiral spring, or a pendulum might be sustained in a horizontal position, and a sliding index be moved by either of them, so that the extreme deviations might be

\* Memoires de l'Academie des Sciences de Petersburg, 6me series, tome i. p. 4.

indicated by it. This, however, would not give even the comparative measure exactly, because a difference in the velocity of the rising or falling of the earth's surface would affect the instrument."

Were observers always to employ vessels of the same dimensions, as for instance hemispherical cups of earthen-ware, painted white interiorly, having a diameter of ten and a depth of five inches fixed on a standard a foot in height, and filled for two inches of their depth by a fluid as nearly as possible of the same tenacity as treacle, the observations made at different points would be comparable with each other, and it would perhaps be a simpler method of estimating the intensity of the shock, than either of those proposed by Professor Babbage, were a graduated semi-circular arc to be fitted inside the cup, and the difference between the highest and lowest points of the wave caused by the shock, to be observed from it. This difference would be in a certain degree proportional to the intensity, being greater, as it was greater and less as it was less; and although it would after all be but a rough approximation, still it would be interesting, and worthy of remark.

The discussion of all local observations ought to be undertaken by one person, who by combining them properly, would be able to deduce general results of the highest interest. It may be long ere we can find any means of protection against the appalling, and apparently irresistible effects of such convulsion as Earthquakes, but if observation confirms the idea of their connection with a certain geological structure of country, we shall at least be able to point out where danger is to be peculiarly apprehended, and by avoiding such localities, diminish the fearful records of death and suffering, by which the occurrence of Earthquakes has hitherto been accompanied.

It will afford the writer the highest satisfaction to be furnished with detailed accounts of Earthquake shocks, in whatever part of India they may occur; and in any cases in which the expence of Postage may be a consideration to observers, he begs they will have no hesitation in forwarding their remarks to him "bearing."\* The subject is one of deep interest and importance, and the co-operation of observers in all parts

\* Communications on the subject of Earthquakes may be addressed to the author at Saharunpore, Upper India, or if preferred, he has no doubt the pages of this Journal will be cheerfully opened to them.

Most unquestionably. Any number of copies of any such paper will be printed and stitched as a pamphlet for (gratis) distribution, and distributed as required, or sent to the author.

of the country is earnestly solicited, since it is only by wide-spread observations that justice can be done to the subject, and such observations it is quite impossible for any single individual to collect satisfactorily.

Saharsapore, 5th April, 1842.

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*Notice of the predatory and sanguivorous habits of the Bats of the genus Megaderma, with some Remarks on the blood-sucking propensities of other Vespertilionidæ. By EDWARD BLYTH, Curator to the Asiatic Society.*

Chancing, one evening, to observe a rather large Bat enter an out-house, from which there was no other egress than by the door-way, I was fortunate in being able to procure a light, and thus to proceed to the capture of the animal. Upon finding itself pursued, it took three or four turns round the apartment, when down dropped what at the moment I supposed to be its young, and which I deposited in my handkerchief. After a somewhat tedious chase, I then secured the object of my pursuit, which proved to be a fine pregnant female of *Megaderma lyra*. I then looked to the other Bat which I had picked up, and to my considerable surprise, found it to be a small *Vespertilio*, nearly allied to the European *V. pipistrellus*, which is exceedingly abundant not only here, but apparently throughout India, being the same, also, to all appearance, as a small species which my friend Dr. Cantor procured in Chusan: the individual now referred to was feeble from loss of blood, which it was evident the *Megaderma* had been sucking from a large and still bleeding wound under and behind the ear; and the very obviously suctional form of the mouth of the *Vampyre* was of itself sufficient to hint the strong probability of such being the case. During the very short time that elapsed before I entered the out-house, it did not appear that the depredator had once alighted; but I am satisfied that it sucked the vital current from its victim as it flew, having probably seized it on the wing, and that it was seeking a quiet nook where it might devour the body at leisure. I kept both animals wrapped separately in my handkerchief till the next morning, when procuring a convenient cage, I first put in the *Megaderma*, and after observing it some time, I placed the

other Bat with it. No sooner was the latter perceived, than the other fastened on it with the ferocity of a Tiger, again seizing it behind the ear, and made several efforts to fly off with it, but finding that it must needs stay within the precincts of the cage, it soon hung by the hind-legs to one side of its prison, and after sucking its victim till no more blood was left, commenced devouring it, and soon left nothing but the head and some portions of the limbs. The voidings observed very shortly afterwards in its cage resembled clotted blood, which will explain the statement of Steedman and others concerning masses of congealed blood being always observed near a patient who has been attacked by a South American *Vampyre*.

Such, then, is the mode of subsistence of the *Megaderma*. The sanguivorous propensities of certain Bats inhabiting South America have long been notorious, but the fact has not heretofore been observed of any in the old world\*; and the circumstance of one kind of Bat preying upon another is altogether new, though I think it not improbable that the same will be found to obtain (to a greater or less extent) among the larger species, if not throughout the whole extensive allied genus of *Rhinolophus*, (or the horse-shoe Bats,) which, like *Megaderma*, are peculiar to the Eastern world.

It may appear strange, that with the multitudinous attestations ascribing blood-sucking habits to certain Bats of South America, naturalists have been found unwilling to credit the statement, as instanced by Mr. W. S. McLeay, who, in a note appended to the remark that a

\* There are, it is true, certain vague statements, but quite unworthy of credit, ascribing sanguivorous habits to the *Pteropodes*. Thus De Vaux, in his 'Lettres from the Mauritius,' (p. 65), describes these animals to "feed indiscriminately on fruit, small warm-blooded animals, and insects, as well as to suck the blood of men and cattle." But were this the case, the fact would assuredly be well known in India, where "Flying Foxes," as they are termed, are so very abundant. Of one brought alive into France, it is indeed stated, that "during the voyage, on one occasion when its food ran short, it fastened upon a dead fowl, and made a meal of part of it; and from that time animal food was occasionally given to it:" but I doubt much whether this was a natural appetite of the creature, from observation of one exhibited in England by Mr. Cross, of the Surrey Zoological Gardens, and *puffed* by him in advertisements and hand-bills as the wondrous "*Vampyre*." This animal would eat nothing but fruit and vegetables, and constantly refused insects, a variety of which I offered to it. It was tame, and appeared fond of being noticed. Hence I am also inclined to doubt a statement which I have somewhere met with, to the effect that the little *Kiodote* is partly insectivorous, this animal being known with certainty to feed largely on the fruit of the *Eugenieæ*.

particular species of butterfly, inhabiting Cuba, is much preyed upon towards the evening by different species of Bats, adds "principally the *Phyllostoma Jamaicense* [*Arctibeus Jamaicensis*, Leach]. By the way," remarks this observer, "in the 2d edition of the *Règne Animal*, the author says of the *Phyllostomes*, 'Ce sont des animaux d'Amerique, qui ont l'habitude de sucer le sang des animaux;' I can only say that this is not only quite untrue as respects the Cuban species, but perfectly impossible [!]. The *Ph. Jamaicense*, for instance, lives on fruits and winged insects, in search of which latter it will be found in bed rooms. The *Vampyre* Bat of South America is also a *Phyllostoma* of Cuvier and Geoffroy; but until some person having pretension to the name of naturalist shall establish the fact on personal observation, I shall as readily believe that it sucks the blood of men as that the *Caprimulgus* sucks the milk of goats."—*Trans. Zool. Soc.*, I, 187.

This is rather a sweeping denunciation of the detailed assertions of Condamine, Steedman, and a host of others, though there is now every reason to conclude that Mr. McLeay is perfectly correct, so far at least as regards the *Phyllostomata* attacking large animals; and concerning this genus, too, he mentions a fact which is not generally known, stating that its members are partly frugivorous. The same is, however, also noticed by Mr. Swainson, who informs us, (*Class. Quadrupeds*, p. 94,) that "several of the Brazilian Bats are likewise frugivorous, and to such a degree, that we remember never having been able to secure a ripe fig from a garden we possessed at Pernambuco, and where many of these trees grew: nets, indeed, were spread over them, but the cunning animals seemed to have the instinct of mice; they crept under the smallest opening, and completely baffled our endeavours to stop their plunderings." But this author also notices the sanguivorous habits of at least some South American species, mentioning that, "Our horses and mules, after having arrived at the end of a day's journey, and been turned out to graze, would be brought in by the guides in the morning with their shoulders covered with blood."

To be brief, in all instances wherein the habits of the *Phyllostomata* have been directly observed, the result has corresponded with the above statements. Mr. Waterton, for example, tells us, in his celebrated 'Wanderings,' "As there was a free entrance and exit to the *Vampyre* in the loft where I slept, I had many a fine opportunity of paying atten-

tion to this nocturnal surgeon. He does not always live on blood. When the moon shone bright, and the fruit of the banana was ripe, I could see him approach and eat it. He would also bring into the loft, from the forest, a green round fruit, something like the wild guava, and about the size of a nutmeg. There was something, also, in the blossom of the suwarrè nut tree, which was grateful to him; for on coming up a creek, on a moonlight night, I saw several Vampyres fluttering round the top of the suwarrè trees, and every now and then the blossoms, which they had broken off, fell into the water. They certainly did not drop off naturally, for on examining several of them, they appeared quite fresh and blooming. So I concluded the Vampyres picked them from the tree, either to get at the incipient fruit, or to catch the insects which often take up their abode in flowers.

“There are,” according to Mr. Waterton, “two species of Vampyre in Guiana, a larger and a smaller. The larger sucks men and other [mammiferous] animals; while the smaller seems to confine itself chiefly to birds. I learned from a gentleman, high up the river Demarara, that he was completely unsuccessful with his fowls, on account of the small Vampyre. He shewed me some that had been sucked the night before, and they were scarcely able to walk.” He then proceeds to give a humorous account of his companion, a North Briton, who had been bitten by one of these creatures, and lay muttering imprecations on the whole race of them. “As soon as there was light enough,” writes Mr. Waterton, “I went to his hammock, and saw it much stained with blood. ‘There,’ said he, thrusting his foot out of the hammock, ‘see how these infernal imps have been drawing my life’s blood.’ On examining his foot, I found that the Vampyre had tapped his great toe: there was a wound somewhat less than that made by a leech; the blood was still oozing from it. I conjectured he might have lost from 10 to 12 oz. of blood.

“I had often wished,” continues this observer, “to have been once stung by the Vampyre, in order that I might have it in my power to say it had really happened to me. ‘There can be no pain in the operation, for the patient is always asleep when the Vampyre is sucking him, and as for the loss of a few ounces of blood, that would be a trifle in the long run. Many a night have I slept with my foot out of the hammock, to tempt this winged surgeon, expecting that he



would be there ; but it was all in vain ; the Vampyre never sucked me, and I could never account for his not doing so, for we were inhabitants of the same loft for months together.”—(pp. 174—9).

The very obvious inference is, that the large *Phyllostomata*, which Mr. Waterton, in common with Steedman and the mass of other narrators of the doings of the Vampyre, have accused of this blood-sucking propensity, are totally innocent of the charge, as regards at least their attacking human beings or other large animals ; but that there does exist a true Vampyre, capable of inflicting wounds such as described, which most assuredly the formidable canines of the *Phyllostomata* are quite unfitted for, is equally evident from the above cited testimony alone. According to Condamine, “The Bats, which suck the blood of horses, mules, and even men, when they do not secure themselves from them by sleeping under a tent, are a nuisance, common to most of the hot countries of America, and some of them are of a monstrous bigness [?]: at Borja, and in divers other places, they have entirely destroyed the great cattle, which the Missionaries had introduced, and which had begun to multiply in those parts.” In corroboration of this account, an accomplished modern traveller, Mr. Schomburgh, has assured me, that at Wicki, on the river Berbice, no fowls could be kept on account of the ravages of these creatures, which attacked their combs, causing these to appear white from loss of blood. Goats resisted them best, but even hogs were attacked by them.

In the report of the Committee of the French Academy, upon the results of M. Alcide d’Orbigny’s late expedition, published in the ‘Nouvelles Annales du Museum,’ III, 90, we are informed, that “Dans l’ordre des Carnassiers, M. d’Orbigny a surtout étudié les *Vampyres*, dont il a pu confirmer les habitudes de sucer le sang des animaux, et même de l’homme, et cela sur ces gens et sur les mulets de sa caravanne. L’avidité de ces animaux pour le sang est telle, que les naturels sont obligés pour y soustraire de passer la nuit dans des moustiquaires, et de renfermer soigneusement leurs poules et autre animaux domestiques. Le Vampyre choisit, en général, la nuque, le cou, ou le dos de la victime, afin qu’elle puisse plus difficilement s’en d’ébarasser ; auquel elle fait cependant en se roulant sur le dos.”

Thus far we have still no satisfactory information as to what is the real depredator, for not only is there strong presumptive evidence that this cannot be the *Phyllostoma*, as currently supposed, but the real habits of

this group, so far as positively observed, would appear to be solely frugivorous and insectivorous. To Mr. Charles Darwin we owe the solution of this mystery. "*The Vampyre*", writes this accomplished naturalist, "is often the cause of much trouble, by biting the horses on the withers. The injury is generally not so much owing to the loss of blood as to the inflammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England, and I was therefore fortunate in being present when one was caught on a horse's back. We were bivouacking late one evening near Coquimbo, in Chili, when my servant, noticing that one of the horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers, and secured the Vampyre. In the morning the spot, where the bite had been inflicted, was easily distinguished from being slightly swollen and bloody. The third day afterwards we rode the horse without any ill effect.

"Before the introduction of the domesticated quadrupeds," continues Mr. Darwin, "the Vampyre Bat probably preyed on the Guanaco, or Vicugna, for these, together with the Puma, and Man, were the only terrestrial mammalia of large size, which formerly inhabited the northern parts of Chili. This species must be unknown, or very rare, in Central Chili, since Molina, who lived in that part, says that no blood-sucking species is found in that province."

The specimen here referred to, is now deposited in the Museum of the Zoological Society, and is referrible to the genus *Desmodus* of Prince Maximilian of Saxe Nieud, or *Edostoma* of d'Orbigny, differing very widely in its dental characters from *Phillostoma*, or indeed any other animal previously known. Its entire structure is expressly modified for the *Vampyre's* mode of subsistence. It has only two upper incisors, corresponding to the ordinary middle pair of the *Primates* generally, and which, ordinarily larger than the others, here attain their maximum of development to the exclusion of the latter: they are large, and of singular form, approximated, and occupy the whole space between the canines, are longitudinally bent abruptly inward near the median line, and prolonged and acutely pointed at the tip of the bend, being received into a cavity or sheath behind the lower incisors when the mouth is closed, the under-jaw consequently projecting beyond the upper: together with analogous anket-shaped canines, which are thinly compressed laterally; they form an admirable instrument for blood-let-

ting, inflicting a triple puncture like that of a leech: the lower canines are small and not compressed, and there are four bilobate inferior incisors, the medial separated by a wide interval. Instead of the sharply tuberculated molars of the *Phyllostomes*, and of that division in particular styled *Vampyrus* by systematists, there are even no true molars whatever, intimating that the accustomed food requires no mastication; but there are two false molars immediately behind the canine in the upper-jaw, and three antagonizing with them in the lower, that present only keenly cutting edges, adapted for severing in the manner of a pair of scissors. Nor is this all:—as in carnivorous animals, wherein the food is more readily assimilated, the intestines are consequently less prolonged than in vegetable-feeders, so in the present most remarkable genus, where blood—warm from the living veins, and even quickened by the vital principle,—constitutes the aliment, the intestines (as I have been informed) proceed almost straight to the anus. In short, we have here an animal duly organized for the mode of life so often described, which the *Phyllostomata* are not; and there can scarcely be a doubt that numerous species of *Desmodus* exist in tropical America, being everywhere the veritable *Vampyres* which attack man and other large animals, as a general rule during their sleep, and inflicting wounds so gently with their keenly pointed and lancet-like instruments of incision, that no sense of pain follows to awake their victim. Nevertheless, admitting the great probability of this, there still remain some matters for further explanation, to which my discovery of the predatory habits of the *Megaderma* seems to afford a key.

Among the South American *Vespertilionidæ* having teeth of the ordinary conformation, Professor Bell describes the tongue of the *Phyllostomata* to have “a number of wart-like elevations, so arranged as to form a complete circular suctorial disc, when they are brought into contact at their sides, which is done by means of a set of muscular fibres, having a tendon attached to each of these warts.”\* Now, for what purpose can this be? For drawing forth the juices of fruits? I suspect not: and Spix, it may be remarked, expressly designates his *Glossophaga amplexicaudata*, (which, however, presents another modification of the tongue, this being slender and elongate, and furnished with hair-like papillæ,) *Sanguisuga crudelissima*, a very cruel blood-sucker; an expression which would seem to imply habits analogous

\* Dr. Todd's *Cycl. Anat. and Phys.*, Art. *Cheiroptera*.

to those of the Megaderms ; for these bite away at their victim in savage earnest, while drawing the life-blood from its veins. In short, there are two classes of blood-sucking Bats,—one gentle and insidious, which attack any large animal during its sleep, are expressly organized for this purpose, and doubtless derive their whole sustenance in this way,—and another openly rapacious, which ferociously attack (it may be presumed) any small warm-blooded creature that they can master, and more especially, it is probable, prey on the smaller and weaker members of their own tribe, first drawing their blood, and then devouring them, as instanced by the oriental Megaderms ; and to this latter class, I imagine, many of the large leaf-nosed Bats of South America appertain (though also known to feed both on fruit and insects), and probably also at least the larger *Rhinolophi*.\*

With regard to the *Megaderma lyra*, I am of opinion (founded on further observation of the captive animal), that it is in no degree whatever frugivorous, and the structure of its mouth would imply that it is no insect-hunter ; neither do I think it evinces any disposition to attack small birds, either at roost or moving : but I am led to infer that the smaller *Vespertilionidæ* constitute its main, if not sole, subsistence, and suspect that these are seized while on the wing, and carried off to be devoured at leisure in some quiet recess, the preyer meanwhile sucking the vital fluid from the neck of its victim. There is more energy about it than I have observed in any other kind of Bat, at least during the day : go when you will, it is always lively and on the alert ; and the expression of its physiognomy is far from dull, having comparatively large eyes for a Bat, which are bright and prominent. The species does not appear to be rare about Calcutta.

I may further remark, that the inguinal teats are well developed in this genus, as in the *Rhinolophi* ; equally so, indeed, with the pectoral teats, insomuch that no one who examined them could suppose that they are mere sebaceous glands, as suggested by Prof. Bell in the case of the *Rhinolophi*. This fact is not uninteresting with relation to the described position of the teats in the genus *Cheirromys*.

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\* The tongue of the Megaderms presents nothing remarkable in its conformation ; but the lips are, in this instance, expressly modified for suction, which is not the case in *Phyllostoma*. It is not unlikely that the West Indian genus *Mormoops*, of Leach, is another raptorial form.

Day.	Morning Tide A. M.						Evening Tide P. M.						Weather, &c.		
	Low Water.			High Water.			Wind.	Low Water.			High Water.			Wind.	
	Time.	Height.	Time.	Height.	Range of Tide.	Time.		Height.	Time.	Height.	Range of Tide.				
1 Thursday.	7 49	4 3	1 24	9 11	5 8	S. E. ...	8 3	2 1	1 56	10 9	8 8	South...	6 A. M. rather cloudy, 8 A. M. clear. 8 43 A. M. thunder, day alternately clear and cloudy, 9 30 P. M. cloudy with appearance of rain. 4 20 A. M. squall from S. W., 4 38 light shower, day alternately clear and cloudy. 4 20 A. M. Do. do. 4 47 heavy showers with thunder and lightning. forenoon cloudy with light rain, noon clear. _____ day alternately clear and cloudy. 4 23 A. M. squall with rain, thunder, and lightning, 11 13 passing showers, noon overcast. 2 15 A. M. heavy showers with thunder and lightning, day alternately clear and cloudy. 1 45 A. M. squall with rain, thunder, and lightning, day do. do., 8 43 P. M. thunder and lightning. _____ day alternately clear and cloudy. Forenoon clear, noon sultry, 2 37 P. M. squall from SSW. with thunder, evening clear.		
2 "	8 7	4 8	2 14	9 4	4 8	S. ....	8 12	2 6	2 15	10 4	7 10	S.S.W.			
3 D	8 16	5 1	2 25	9 6	4 5	S.S.W.	9 37	3 11	2 34	10 2	6 3	S. W...			
4 Sunday,	8 49	5 4	2 48	9 3	3 11	S. W...	9 2	5 11	3 2	9 11	4 0	S.S.W.			
5 "	9 6	6 2	3 12	9 1	2 11	S.S.W.	9 13	6 4	3 25	9 4	3 0	S. W...			
6 "	9 49	6 9	3 48	8 9	2 0	S. W...	11 12	6 7	4 19	8 11	2 4	Calm...			
7 "	0 0	0 0	5 43	9 2	0 0	West...	0 17	7 3	6 49	9 8	2 5	S.S.W.			
8 "	1 12	7 4	7 46	9 9	2 5	S. W...	1 53	6 7	8 36	9 11	3 4	S. W...			
9 "	2 14	5 6	9 15	10 1	4 7	S. W...	2 43	5 2	9 27	11 2	6 0	N. ....			
10 "	3 0	4 11	10 4	10 10	5 11	S. W...	3 32	4 7	10 46	11 6	6 11	S. S. W.			

6 A. M. rather cloudy, 8 A. M. clear.  
 8 43 A. M. thunder, day alternately clear and cloudy, 9 30 P. M. cloudy with appearance of rain.  
 4 20 A. M. squall from S. W., 4 38 light shower, day alternately clear and cloudy.  
 4 20 A. M. Do. do. 4 47 heavy showers with thunder and lightning. forenoon cloudy with light rain, noon clear.  
 — day alternately clear and cloudy.  
 4 23 A. M. squall with rain, thunder, and lightning, 11 13 passing showers, noon overcast.  
 2 15 A. M. heavy showers with thunder and lightning, day alternately clear and cloudy.  
 1 45 A. M. squall with rain, thunder, and lightning, day do. do., 8 43 P. M. thunder and lightning.  
 — day alternately clear and cloudy.  
 Forenoon clear, noon sultry, 2 37 P. M. squall from SSW. with thunder, evening clear.

*Register of the Rise and Fall of the Tide at Prince of Wales Island and  
of the Government of India, —October 1840,*

*to the Editor by order*

Day.	Morning Tide A. M.						Evening Tide P. M.						Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.			
	Time.	Height.	Time.	Height.	Range of Tide.	Wind.	Time.	Height.	Time.	Height.	Range of Tide.	Wind.	
11 Sunday	4 43	3 9	11 12	11 4	7 7	S. W...	5 18	4 5	11 32	11 8	7 3	S. ....	Forenoon clear, and sultry all day, 11-56 A. M. thunder.
12 "	5 33	2 11	11 23	11 6	8 7	S. S. W.	5 48	2 7	11 47	11 9	9 2	S. W...	Forenoon clear. noon cloudy, afternoon and cloudy.
13 "	6 3	3 9	0 0	0 0	0 0	S. W...	6 9	2 1	0 10	11 8	9 7	S. W...	Ch. clear and cloudy, 2.
14 "	6 18	3 2	0 17	11 2	8 0	S. E. ..	6 32	2 3	0 32	11 7	9 4	S. W...	Do. 5, 7 lightning. 6 A. M.
15 "	6 47	3 11	0 53	10 11	7 0	S. E. ..	6 57	2 5	0 49	12 3	9 10	S. W...	Do. 4 hazy, 11 30 A. M. thunder, 11 49 squally, noon light rain.
16 "	7 2	4 6	1 9	10 9	6 3	Calm. ..	7 12	2 11	1 15	11 7	8 8	S. W...	Forenoon clear, noon cloudy, 1 34 P. M. squally, 2 P. M. drizzling rain, 6 52 thunder.
17 "	7 20	5 4	1 23	10 6	5 2	S. E. ..	7 54	4 10	1 49	11 2	6 4	S. ....	Forenoon clear, noon cloudy, 25 P. M. thunder, 5 46 P. M. drizzling rain, 6 52 thunder.
18 Sunday	8 17	5 6	2 23	10 1	4 7	S. W...	8 49	5 1	2 37	10 11	5 10	S. S. W.	6 55 A. M. light rain, 8 25 thunder, day cloudy throughout.
19 "	9 23	5 4	3 13	9 10	4 6	North.	10 27	6 1	3 38	9 9	3 8	W. ....	2 48 A. M. thunder, 10 25 light rain, noon cloudy, afternoon rather clear.
20 "	10 46	6 2	5 19	0 0	3 8	North.	11 42	6 4	5 56	9 8	3 4	S. W...	7 A. M. thunder, 8 54 showers, day cloudy throughout.
21 "	0 0	0 0	6 27	9 11	0 0	N. E. ..	2 18	6 3	8 17	10 3	4 0	S. W...	Day alternately clear and cloudy, 1 10 P. M. thunder.
22 "	2 38	5 10	8 49	10 2	4 4	N. W.	2 43	5 3	9 27	10 9	5 6	S. W...	Ditto do. do., 2 4 P. M. thunder and lightning.

Day.	Morning Tide A. M.						Evening Tide P. M.						Wind.	Weather, &c.	
	Low Water.			High Water.			Low Water.			High Water.					Range of Tide.
	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.							
23	3 7	5 6	9 39	10 7	5 1	N. ....	3 18	4 5	10 5	11 2	6 9	N. W....	7 A. M. thunder, day alternately clear and cloudy, 11 43 A. M. passing shower, 2 3 P. M. thunder.		
24	3 34	5 2	10 23	10 10	5 8	N. ....	4 13	3 11	10 48	11 4	7 5	N. ....	Clear all day, 1 57 P. M. thunder and lightning, 2 48 light rain.		
25	4 18	4 10	11 8	11 1	6 3	W. .	4 27	3 2	11 38	11 5	8 3	E. ....	Forenoon clear, afternoon cloudy, 3 57 P. M. thunder and lightning, 4 12 rain.		
26	4 39	5 3	11 34	11 6	6 3	W. ..	4 52	2 11	11 58	11 4	8 5	N. ....	9 43 A. M. light rain, noon cloudy, 7 30 P. M. drizzling rain.		
27	5 3	5 1	0 0	0 0	0 0	W. ....	5 10	2 3	0 6	10 11	8 8	W. ....	— cloudy all day, 3 8 P. M. thunder, 3 25 rain.		
28	5 18	5 7	0 17	10 9	5 2	W. ....	5 32	2 1	0 23	11 1	9 0	South...	Ditto ditto 7 9 P. M. light rain until midnight.		
29	5 45	5 8	0 38	10 2	5 6	N. W....	5 58	1 11	0 58	11 3	9 4	S. W....	Ditto ditto, 10 52 A. M. light rain.		
30	6 2	5 10	1 7	10 1	4 3	N. W....	6 7	2 3	1 8	10 11	8 8	S. W....	2 23 A. M. heavy showers, 0 45 P. M. thunder, day alternately clear and cloudy.		
31	6 12	5 7	1 13	9 11	4 4	N. W....	6 23	4 7	1 20	10 10	6 3	South...	Forenoon alternately clear and cloudy, noon dark and cloudy with thunder, 1 55 P. M. rain.		

*Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India,—November 1840.*

Day.	Morning Tide A. M.					Evening Tide P. M.					Wind.	Range of Tide.	Weather.
	Low Water.			High Water.		Low Water.			High Water.				
	Time.	Height.	Time.	Height.	Range of Tide.	Time.	Height.	Time.	Height.				
1 Sunday.	6 29	5 2	1 28	9 6	4 4	W. ....	6 57	5 4	1 34	10 7	5 3	S. ...	4 25 A. M. thunder, 35 P. M. thunder, 2 15 showers, day alternately clear and cloudy.
2 "	7 8	5 7	2 7	9 3	3 8	N. W. ...	7 28	5 9	2 13	9 11	4 2	N. ....	6 47 A. M. light rain, 15 P. M. drizzling rain with thunder.
3 "	7 56	6 2	2 37	9 3	3 1	N. ....	8 53	5 11	2 17	9 2	3 3	S. ....	1 34 A. M. thunder, 1 47 passing showers, day alternately clear and cloudy.
4 "	9 8	6 3	3 12	8 9	2 6	N. ....	10 53	6 7	3 52	8 7	2 0	S. ....	Day alternately clear and cloudy.
5 "	11 54	5 8	6 15	8 8	2 0	N. ....	0 0	0 0	6 16	9 3	0 0	S. W. ...	Ditto ditto, 3 20 P. M. light rain with thunder
6 "	0 49	6 2	7 57	9 7	3 5	N. ....	1 45	5 3	8 48	9 10	4 7	N. E. ...	Cloudy all day, 2 18 P. M. thunder with appearance of rain.
7 "	2 12	5 6	9 18	10 1	4 7	N. ....	2 22	4 7	9 34	10 4	5 9	N. E. ...	noon overcast, 2 24 P. M. 9 24 light showers.
8 Sunday.	2 32	5 2	9 47	10 7	5 5	S. ....	2 43	4 2	9 56	10 9	6 7	N. W. ...	clear and cloudy, 2 10 M. P. drizzling rain.
9 "	2 57	3 11	10 5	10 11	7 0	S. ...	3 19	3 1	10 29	11 2	8 1	N. W. ...	5 27 A. M. squall from westward with rain, day alternately clear and cloudy.
10 "	3 28	3 7	10 35	11 5	7 10	S. W. ...	3 39	2 3	10 49	11 4	9 1	N. W. ...	5 57 A. M. light rain, day overcast.
11 "	3 52	4 5	11 13	11 6	7 1	S. ....	4 17	1 11	11 23	11 5	9 6	N. ....	4 56 A. M. squall from westward with rain, day alternately clear and cloudy.
12 "	4 20	4 7	11 37	11 8	7 1	W. ....	4 48	2 3	11 54	11 2	8 11	S. ....	2 37 A. M. ditto ditto ditto ditto.
13 "	5 47	4 8	0 0	0 0	0 0	Calm.	6 18	2 3	0 17	11 6	9 3	Calm.	11 28 A. M. A passing shower, day alternately clear and cloudy, 1 30 P. M. thunder.



Day.	Morning Tide a m.					Winds	Evening Tide p. m.					Wind.	Weather, &c.
	Low Water.		High Water.		Range of Tide.		Low Water.		High Water.		Range of Tide.		
	Time.	Height.	Time.	Height.			Time.	Height.					
14 "	6 49	4 11	0 28	10 11	6 0	N. ....	7 19	2 4	1 7	11 3	8 11	W ....	4 53 A. M. rain, 5 10 squall from westward, 25 P. M. rain, day cloudy throughout, 6 50 P. M. light rain.
15 Sunday.	7 49	5 2	1 27	10 8	5 6	N. W.	8 5	3 2	1 52	11 1	7 11	W. ....	Day alternately clear and cloudy, 5 54 P. M. light rain.
16 (	8 19	5 3	2 12	10 3	5 0	N. E. ...	9 8	3 5	2 36	10 6	7 1	S. ....	Ditto ditto, 8 5 P. M. ditto.
17	9 17	5 8	3 12	10 1	4 5	N. ...	10 53	5 3	3 24	9 3	4 0	W. ....	Ditto ditto, strong westerly wind prevailing, 5 56 P. M. squall from northward with rain.
18 "	11 56	5 11	5 57	9 5	3 6	N. ....	0 0	0 0	6 47	9 4	0 0	W. ....	7 12 A. M. drizzling rain, 1 15 P. M. thunder, 1 43 rain, 7 32 showers, 7 45 thunder.
19 "	0 53	5 6	7 12	9 6	4 0	N. ....	1 12	6 2	7 32	9 8	3 6	W. ....	8 19 A. M. ditto ditto, noon rather clear, 3 5 P. M. showers.
20 "	1 33	5 9	7 54	9 11	4 2	N. ....	1 56	3 11	8 13	9 11	6 0	N. W.	day overcast.
21 "	2 23	5 4	8 42	10 3	4 11	N. ....	2 49	3 5	9 13	10 2	6 9	N. ....	P. M. rain with thunder
22 Sunday.	3 15	4 7	9 56	10 11	6 4	N. ....	3 47	2 11	10 12	10 9	7 10	N. E. ...	Porenoon alternately clear and cloudy, 0 34 P. M. heavy showers, 1 5 thunder, 6 42 light rain, 7 2 thunder.
23 "	4 14	4 5	10 20	11 2	6 9	N. ....	4 23	2 6	10 34	11 1	8 7	N. ....	6 52 A. M. light rain, noon cloudy, 3 32 P. M. rain.

to the Editor by order

Register of the Rise and Fall of the Tide at Prince of Wales Island  
of the Government of India,—November

Day.	Morning Tide A. M.					Winds.	Evening Tide P. M.						
	Low Water.			High Water.			Range of Tide.	Low Water.			High Water.		Range of Tide.
	Time.	Height.	Time.	Height.	Time.			Height.	Time.	Height.			
24 ●	4 49	4 8	10 53	10 11	6 3	N. E. ..	5 7	2 3	11 12	11 2	8 11 1	P. M.	
25 "	5 13	4 3	11 18	10 10	6 7	N. ....	5 19	2 1	11 28	11 3	9 2 1	light	
26 "	5 28	4 1	11 36	10 11	6 10	N. W.	5 42	2 6	11 58	11 4	8 10 1	moon	
27 "	6 7	5 6	0 0	0 0	0 0	N. ....	6 17	2 9	0 13	10 11	8 2 1		
28 "	6 42	5 7	0 28	11 1	5 1	N. W.	6 58	3 1	0 53	10 9	7 8	Ditto ditto, 9 17 A. M. squall from southward with light rain.	
29 Sunday	7 9	5 11	1 5	10 10	4 11	N. ....	7 18	3 4	1 20	10 6	7 2	S. W. ... 5 17 A. M. squall from westward, 5 32 heavy showers, day alternately clear and cloudy.	
30 "	7 43	5 8	1 32	10 4	4 8	N. ....	8 6	3 6	1 56	10 4	6 8	S. W. ... 5 17 A. M. heavy showers, day alternately clear and cloudy.	

Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished by the Editor by order of the Government of India, — December, 1840.

Day.	Morning Tide A. M.						Evening Tide P. M.						Weather, &c.
	Low Water.			High Water.			Low Water.			High Water.			
	Time.	Height.	Range of Tide.	Time.	Height.	Wind.	Time.	Height.	Time.	Height.	Range of Tide.	Wind.	
1 Tuesday	8 11	5 9	2 12	9 11	4 2	N. ....	8 23	4 2	2 15	10 2	6 0	S. W...	Day alternately clear and cloudy, 1 34 P. M. thunder.
2 "	8 34	5 11	2 36	9 7	3 8	N. ....	8 53	4 4	2 47	9 6	5 2	S. by N.	11 27 A. M. showers, noon cloudy, 2 26 P. M. thunder.
3 "	9 12	6 2	3 6	9 7	3 5	N. ....	10 27	5 7	3 19	8 9	3 2	E. ....	lower, 2 23 P. M. and lightning. Day cloudy. t rain, noon thunder.
4 "	10 49	5 9	4 45	8 7	3 10	E. ....	12 0	5 6	5 56	8 10	3 4	N. ....	and cloudy, 11 38 thunder.
5 "	0 0	0 0	6 27	9 8	0 0	N. ....	0 25	4 9	6 57	9 10	5 1	N. ....	noon cloudy, 1 12 with thunder and lightning.
6 Sunday	1 4	5 3	7 25	10 2	4 11	N. ....	1 26	4 2	7 49	10 1	5 11	N. ....	6 53 A. M. ditto, 2 26 P. M. do. do. do. do. Day clear, 5 56 P. M. thunder & lightning.
7 "	1 54	4 11	8 16	10 6	5 7	E. ....	2 7	3 2	8 26	10 3	7 1	N. ....	Day alternately clear and cloudy, 4 25 thunder and lightning. 4 55 rain.
8 "	1 32	4 9	8 49	10 11	6 2	N. W.	2 49	3 7	9 16	10 8	8 1	N. ....	Ditto ditto, 1 28 P. M. rain, 1 56 thunder and lightning.
9 "	2 58	4 8	9 47	11 5	6 9	N. W.	3 25	2 4	9 43	11 3	8 11	N. W...	Ditto do., 0 35 P. M. ditto, 3 30 rain.
10 "	3 52	4 3	10 23	11 10	7 7	N. ....	4 7	2 1	10 42	11 7	9 6	N. W...	5 25, A. M. light rain, 10 9 P. M. squall from westward with rain, &c.
11 "	4 59	3 11	11 19	11 11	8 0	N. ....	5 34	1 11	11 52	11 8	9 9	N. W...	Day alternately clear and cloudy, 7 8 P. M. squall with rain. [clear & cloudy.
12 "	5 54	4 11	0 0	0 0	0 0	S. W...	6 12	2 4	0 17	12 2	9 10	S. W...	9 A. M. heavy showers, day alternately
13 Sunday	6 53	5 7	0 28	11 9	6 2	W. ....	7 9	2 11	1 9	11 11	9 0	S. ....	
14 "	7 27	5 2	1 37	11 5	6 3	N. W.	7 49	3 11	1 43	11 4	7 5	S. W...	

Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India,—December, 1840.—(Continued.)

Day.	Morning Tide A. M.					Evening Tide P. M.					Weather, &c.
	Low Water.		High Water.		Range of Tide.	Wind.		Low Water.		Range of Tide.	Wind.
	Time.	Height.	Time.	Height.		Time.	Height.	Time.	Height.		
15	8 4	5 3	2 6	10 11	5 8	N. W...	8 29	6 1	2 23	10 6	S. ....
16	8 49	5 6	2 45	10 3	4 9	N. ....	9 7	6 2	2 56	9 5	S. E. ...
17	9 17	5 9	3 14	9 8	3 11	S. W...	10 17	6 3	3 38	9 3	S. W. ...
18	10 53	5 9	4 28	9 6	3 9	N. ....	11 37	6 4	5 19	8 5	N. ....
19	11 58	5 6	5 57	9 8	4 2	N. ....	0 0	0 0	6 15	8 4	S. W. ...
20	0 16	5 7	6 34	9 8	4 1	N. W...	0 47	5 4	7 24	8 9	N. W...
21	1 12	5 7	7 37	10 2	4 7	N. ....	1 53	4 6	8 24	9 7	S. W...
22	2 11	5 4	8 32	10 7	5 3	S. ....	2 43	4 2	9 57	10 1	S. W...
23	2 57	5 2	9 5	10 4	5 2	N. ....	3 14	3 7	9 37	10 3	N. ....
24	0 0	0 0	0 0	0 0	0 0	.....	0 0	0 0	0 0	0 0	.....
25	0 0	0 0	0 0	0 0	0 0	.....	0 0	0 0	0 0	0 0	.....
26	0 0	0 0	0 0	0 0	0 0	.....	0 0	0 0	0 0	0 0	.....
27 Sunday	0 0	0 0	0 0	0 0	0 0	.....	0 0	0 0	0 0	0 0	.....
28	0 0	0 0	0 0	0 0	0 0	.....	7 57	3 2	0 0	0 0	N. E. ...
29	8 11	4 11	2 11	10 2	5 3	N. E. ...	8 17	4 2	2 18	10 9	S. E. ...
30	8 28	5 6	2 27	9 11	4 5	N. ....	8 47	4 6	2 36	10 7	S. E. ...
31	8 56	5 9	2 57	9 8	3 11	N. ....	9 7	4 9	3 12	10 6	E. ....

No observation in consequence of the buoy of the tide-gauge being worn out by friction.

Day alternately clear and cloudy.  
Ditto ditto ditto, 11 45 A. M. light rain, 6 17 P. M. showers, 6 17 P. M. showers.

Ditto ditto ditto, 1 15 P. M. light passing showers, 3 30 P. M. thunder with frequent showers.  
Ditto ditto ditto, 1 37 P. M. rain.  
(Signed,) W. M. HOOVER.

*Proceedings of the Asiatic Society.*

(Friday Evening, 4th March, 1842.)

The Hon'ble the President in the Chair.

The following Books were presented :—

*Books received for the Meeting, on the 4th March, 1842.*

The Calcutta Christian Observer, new series, vol. 3d, No. 27, March, 1842, ..	P
The Oriental Christian Spectator, 2d series, vol. 2d, No. 12th, Dec. 1841, and vol. 3rd, No. 1st, January 1842, ....	P
Yarrell's History of British Birds, part 27, London, October, 1841, ....	P
The Annals and Magazine of Natural History, vol. 7th, No. 47, and vol. 8th, No. 49, September and October, 1841, London, ....	P
London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 3rd series, vol. 19th, Nos. 123-124, September, and October, 1841, London, ....	P
Memoir of the Royal Astronomical Society of London, 1840, vol. 11th, ....	1
Journal des Savants, Juin à Juillet, 1841, Paris, ....	2
Proceedings of the Geological Society of London, vol. 3rd, part 2nd, No. 76, 1841, ....	P
Sykes's Notes on the Religious, Moral, and Political State of India, London, 1841, ....	1
Sykes's Fishes of the Dukhun, ....	1
The Calcutta Literary Gleaner, vol. 1st, No. 1. ....	P
McCosh's Medical Advice to the Indian Stranger, London, 1841, ....	1
Three Volumes of Dewan and Masnevi, by Hakeem Rookeen-Uddeen of Kashaud, in good preservation, perfect, MSS. complete and well written, were offered for sale. Referred to the Committee of Papers.	

The following letter from Mr. Csoma De Koros was read. The account referred to, accompanied it :—

TO H. TORRENS, ESQ.

*Secretary to the Asiatic Society of Bengal, &c.*

SIR,—Since I am about to leave Calcutta, for a certain period, to make a tour in Central Asia, if possible, I beg you will receive and keep this memorandum, after you have communicated it with the Asiatic Society.

I respectfully acknowledge, that I have received many benefits from the Asiatic Society, although I have declined always to accept the allowance of fifty rupees, which they generously granted me in 1829, 1831, and 1841; since the Government's allowance to me, during several years, was sufficient for my support.

I intend to return again to Calcutta, and to acquaint the Society with the results of my travels. But, in case of my death on my intended journey; since I sincerely wish the prosperity, and pray for the long continuance of this noble establishment, I beg to leave my Government Securities, as also the Books and other things now taken with me, at the disposal of the Asiatic Society, delivering herewith to you my last

account of the 31st of January 1842, with the Government Agent, who is my attorney ; and with whom the Promissory Notes are kept, and who will favour me, once a year, with the interest on those papers.

Since I purposely decline every correspondence with those in Europe, I beg you will kindly excuse me, if any letter or packet should be sent to me, do with it as you think best.

I remain with much respect,

Sir,

Your most obedient Servant,

Calcutta, 9th February, 1842.

A. CSOMA DE KOROS.

The Secretary was requested to reply to Mr. CSOMA, expressing the Society's willingness to accept the *Trusteeship* of his funds for his benefit, its earnest desire to forward his views in India in every possible way, and to render him any assistance ; as well as its willingness to receive any further directions as to his funds ; and its best wishes for his welfare and safe return from his enterprising expedition into Bootan and Tartary. It was also determined, that a copy of Mr. CSOMA's letter should be transmitted to the Government Agent.

The following letter from Professor WILSON was also read :—

*East India House, 30th October, 1841.*

MY DEAR SIR,—In a short letter I sent you by Mr. Coles, I informed you, that the copies of the *Travels of Messrs. Moorcroft and Trebeck*, which had been distributed here, were distributed in the name of the Society, and that any Societies not included in the list to which the Asiatic Society might wish to extend the presentation copies, might probably be supplied with them from those I had retained. They cannot be many. The book is not of much interest to Oriental scholars, and there are not many individuals or Societies in communication with the Asiatic Society engaged in other than Oriental literary inquiries. The chief purpose of my addressing you at present, however, is to ascertain the possibility of procuring subscriptions through the Society for a work I have just published. *Ariana Antiqua*, an account of the Coins and Antiquities of Afghanistan ; it is a description in fact of Mr. Masson's Collections, and of some others at the India House. It is a goodly quarto volume of some 400 pages, and is intended to be a resumé of all that has been written on the Bactrian Topes and Coins. The text is illustrated by engravings of sundry Antiquities, of all the Topes opened by Mr. Masson, and of many hundred Coins from those of Euthydemus to those of the first Mahommedan invaders of India. The expence of the book has been liberally defrayed by the Court of Directors, who take part of the edition, out of which they will send a few copies to Bengal, from whence the Society will no doubt be supplied. The remaining portion, 300 copies, the Court has presented to Mr. Masson's mother, and it is for her benefit that the subscription is proposed. The price in England is 2 Guineas—allowing for expences, &c. the Indian subscription rate should be I imagine 25 Rupees. If you can procure any name from amongst those interested in Mr. Masson and his pursuits, and will send them to me with information how the subscription is to be realised, (or perhaps it would be advisable to deposit the amount with some agency house,) I will take care that all such copies as may be procurable shall be forwarded. Mr.

Lewis (Masson) has some of the copies subscribed for here, and expects some from Bombay, so that there will not be many left for Bengal.

Yours very truly,  
H. H. WILSON.

### ARIANA ANTIQUA,

*Just published by Professor WILSON.*

An account of the Coins and Antiquities of Afghanistan, being a description of Mr. Masson's Collections, and others at the India House, in one vol. quarto, pages about 400. The text illustrated by engravings of sundry Antiquities from all the Topes opened by Mr. Masson, and of many hundred Coins, from those of Euthydemus to the first Mahomedan invaders of India.

A few copies can be yet subscribed for in India, and the Secretary of the Asiatic Society will be glad to register names, with references for payment in India or England. Indian Subscription rate about 25 Rupees.

It was determined, that the work should be advertised in the Journal, and the Society should there state its readiness to become Agents for those who might desire to subscribe for it.

A second letter from Professor WILSON of 1st November 1841, referring to the incomplete numbers of volumes of the Mahabarat was read, and referred to the Librarian and Accountant to report upon.

The Annual Statement of the accounts of the Society's Booksellers, Messrs. W. H. ALLEN and Co. was also read, and with its enclosures referred to the Librarian and Accountant.

Read a note from J. W. ROBERTS, Esq. forwarding a highly interesting account of the eruption of the Volcano of Kilauea, (Sandwich Islands,) published in the Boston Baptist Missionary Magazine for August 1841.

Read a letter from Lieut. TICKELL, Kolehan, to the Curator, advising the dispatch of the skins of a Gaur and a Saumer, prepared for the purpose of setting up in the Museum. A paper of measurement of the Gaur accompanied this letter, which will appear in the Journal.

The recovery of Capt. HERBERT's valuable Catalogue of the Himalayan Geological Specimens, collected during his survey, was announced to the Society. These valuable MSS. which had been the objects of most anxious search on the part of the Secretary and the Acting Curator, Mr. PIDDINGTON, and of which almost all hope had been abandoned, were fortunately traced, through the assistance of Mr. WILKIN, late Mining Assistant in Kemaon, to that district, where they were found to be in the hands of J. H. BATTEN, Esq. C. S. Assistant Commissioner, Kemaon, from whom a letter was read, stating, that they would be shortly sent down upon his return from a tour of duty in the district.

Read a letter of the 24th February last, from Major THOS. WILKINSON, Resident of Nagpore, announcing the dispatch from Nagpore of a facsimile of an Inscription,

from a large stone found at the village of Aurung in Chutteesgurb, about 200 miles east of Nagpoor, to which place, however, the stone had been brought by him.

The Inscription has since been read; it is without date, but Boodhist, and of about A. D. 850. The following is an abstract of it:—

*Abstract.*

“ There was a Raja named *Surya Ghose*, who on the sudden death of his infant son, being overwhelmed with grief, and conscious of the instability of the wordly pursuits, caused a magnificent building to be erected for the refuge of *Moonees*, (Ascetics). After a long series of years, he had another son, who was afterwards publicly known by the celebrated name of *Udayana*.

“ *Udayana* had four sons, among whom *Bhabadeva* was the youngest. His son was *Ranakesharé*, who was the last Raja of that line. He repaired the palace of the *Moonees*, which had once been erected by his great-grandfather, and injured by time. Further, he caused many gardens, tanks, wells, and many charity houses to be made throughout.”

Read a letter of Mr. STEFANO MORRICAND, Administrateur du Musée Académique à Geneve, addressed to the late Mr. BENSON, C. S. proposing to exchange specimens of Shells with him. This letter was transmitted to the Society by Dr. WISE, B. M. S.; but it was thought right that it should be referred in the first instance to Mr. BENSON's executors.

La Commission de la Bibliothym de la Ville de Berne, acknowledged the receipt of the 18th volume of the Society's Transactions through their President, M. CHAR. TERLEDER.

Read a letter from G. A. BUSHBY, Esq. Secretary to Government, General Department, transmitting copy of a letter from the Military Board, with copy of one from Capt. TREMENEERE, and a box containing specimens of Magnetic Iron Ore, Sulphuret of Antimony, and of Mergui Coal.

Read a letter from Lieut. H. K. SAYERS, S. P. H. M. 31st Regt. offering for the Journal of the Society, Recollections of a Visit to Madura, the capital of the Bulloo Country, Western Africa.

For the Contributions and Presentations, thanks were accorded.

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# JOURNAL

OF THE

## ASIATIC SOCIETY.

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*Notice of the Mammals of Tibet, with Descriptions and Plates of some new Species. By B. H. Hodgson, Esq., Bengal Civil Service.*

Very little is known accurately of the Zoology of Tibet. Having lately received some valuable materials for its illustration from Digurchee and Lassa, I purpose, with the aid of these specimens, and of information procured orally and from books, to give a cursory notice of the subject.

### CARNIVORA.

#### FELIDÆ.

1. Genus *Felis*, F. *Uncia*. Exactly answers Buffon's description, and is evidently the representative in high latitudes of the tropical Leopards. Equal in size to a Leopard of the largest dimensions, and distinguished not only by its long full pelage and very thick tail, thicker even than in *Macrocelis*, but also by its massive structure and for the comparative absence of compression in the talons, wherein there is a vague approach to *Cynailurus*. Length from snout to vent about four feet, and the tail about  $2\frac{1}{2}$  to  $2\frac{1}{2}$  feet. Never met with on this side the snows, and is said to be a cowardly unenterprising animal compared with the next species.\*

2. *Felis Macrocelis*. Found on both sides of the snow in lofty Cisalpine sites as well as in Tibet; osculant in habitat, and in structure be-

\* There is a fine stuffed specimen of *Felis uncia* in the British Museum, procured, I believe, in the North of Persia, from which locality, Col. Hamilton Smith also saw a skin of this species, which he has represented in Griffith's *Animal Kingdom*, II, 469. I am not certain that the *F. irbis*, or long-haired Altaic Panther, of Humboldt and Ehrenberg is distinct from the Ounce, but have no description of the *Irbis* to refer to.—*Curr. As. Soc.*

tween the typical pards of the south and of the north; agrees with the last in its massive form, long full fur and thick tail, which last, however, is proportionally longer and hardly so thick. *Macrocelis* is further distinguished remarkably by the unusual length, slenderness, and insulation of the canines. In these hills, Europeans frequently confound it with the Leopards, thereby increasing the difficulty of deciding how many true pards there be, though its dull hue, and the more chain-like linear form of its marks ought at once to prevent such mistakes. In size too it is considerably less than the true Leopard; but its body has a length from snout to vent of about  $3\frac{1}{2}$  feet, and the tail is nearly 3 feet more. I have several skins procured in the Kachâr of Nepal, in Sikim, and from Digurchee in Tibet. The animal is most fierce and destructive among the flocks.\*

3. *Felis Lynchus*, *Lynchus Europæus* vel *Vulgaris*. Answers exactly to the common type. Is never seen in India any where on this side of the Hemâchal, but is common in Tibet. Possess two skins from Lassa, one of which exhibits dimensions in excess of those usually ascribed to the species by authors. Snout to rump 38 inches, tail  $9\frac{1}{4}$  inches.†

4. *Felis Nepalensis*, necnon *Bengalensis*. Possess one skin brought from beyond the snow, where however the species is rarer much than in the Cisalpine forests.

5. *Felis Domesticus*. The house Cat is common in Tibet. My collection exhibits from Lassa three skins, two black, and the third fawn and white one, with 9 to 10 caudal rings on the paler ground.

6. *Felis Nigripectus*, *Mihi*, new.‡ Size and general proportions of *Catus*, structure typical. Fur very rich and soft, consisting mostly of the inner woolly piles, the longer and hairy ones being scantier; average length of the latter  $1\frac{1}{2}$  inch, with some few hairs as much as  $2\frac{1}{2}$ ; average length of the former or inner fleece,  $1\frac{1}{4}$  inch. General hue rufescent pale cat-grey, like *Chaus*, but paler and fading into rufescent hoary without any black tipped piles below and on the limbs: pads

\* That this fine species, originally discovered in Sumatra, should also inhabit Tibet, is a remarkable circumstance.—*Cur. As. Soc.*

† There are four distinct species of European Lynxes; and the dimensions above given would seem to refer this one to *F. cervaria*: but I will prepare a monograph of the group.—*Ibid.*

‡ Clearly the *F. manul* of Pallas, a description of which may be found in Shaw's Zoology, I, 362, and which Mr. Hodgson has thus the merit of further establishing, inasmuch as it has been regarded as a doubtful species.—*Ibid.*

postally deep rusty: whole chest and front of neck and part of belly confluent sooty black, terminating forward near the ears hornwise or crescentwise: on the crown of the head several series of black dots disposed more or less linearly and lengthwise. On the cheeks from eyes to articulation of jaws two sub-parallel zigzag lines of jet black, five to seven straighter lines and less deep in hue laid transversely across the lower back, and blending gradually with the caudal rings, which are, including the small black tip of the tail, about nine in number. These rings of the tail are narrow, with large intervals diminishing towards its tip, as the interstices of the dorsal bars do towards the tail's base. The caudal rings are perfect all round, save the two basal ones that are deficient below, whilst the two apical ones, on the contrary, are rather wider below and nearly or quite connected there; rings and tip of the tail black outside the arms and thighs two or three transverse black bars more or less freckled with the grey hairs of the body. Ears outside grey like the back, but paler: Ears small and much rounded: tail medial, thick and cylindric: mystaceal and other bristles, some black, mostly rufescent hoary: outer fur or longer piles quadrannulate from the base with hoary, blackish, pale rufous and black; but on the lower surface of the animal these piles are biannulate only with dusky at base, and the rest rufescent hoary, except on the large pectoral dark mark, throughout which the shorter piles are wholly dark, and the longer the same, save at their mere bases: Inner fur, above or generally, slaty black towards the roots; pale rusty towards the tips. Sexes alike, female less in size: Length from snout to vent 22 to 24 inches, mean height 11 to 12, length of tail 10 to 11.

*Remark.*—Possess three specimens, the youngest shewing the marks most clearly, which in the others are grizzled with hoary; in one specimen the tail appears thin, and shews the rings very glaringly, owing to the outer or longer piles being wanting. Found in the wild state generally throughout Tibet, where all cat skins, tame and wild, are much prized for lining dresses, and the animals for food by the Chinese located there.\*

\* There is a *Felis inconspicua*, Gray, suspected to be from Nipal, and described in *Mag. Nat. Hist., N. S.*, 1, 577. "Grizzle-grey, black and white, slightly varied with brownish streaks and waves; beneath white. Back of ears, large spots and cross-bands on the throat, belly, and outside of the legs, black. Two obscure streaks on the cheeks, yellowish, tail elongates cylindrical, grizzled, soles grizzled."

## CANIDÆ.

7. Genus *Canis*. Tame dogs abound, and are much prized by the men for guarding the flocks and herds and houses, and by the women for petting. For the former purpose the Tibetan mastiff is used, of which there are several varieties, black, black and tan, or red with more or less of white. Some have the fifth toe behind. The breed at Lassa and Digurchee are the largest and best. They are good tempered, but dull and heavy, except on their night watch, and are utterly useless for sporting. Nor are any other breeds cultivated for sporting. The ladies dogs are Poodles and Terriers, many of which are pretty, and have long soft hair. The latter flourish in Nepal; the former cannot endure our heat. The Chinese at Lassa and Digurchee fatten the Poodles for the table.

8. Genus *Cúón*, *C. Primævus*. The wild dogs of the Cis-Himalayan regions are found also in Tibet, but rarely. I have four skins from Lassa, but they are all of very young animals. The breed of Tibet is large, and of a pale wolf-like colour.

9. Genus *Vulpes*, *V. Montanus*. Yet commoner in Tibet than on this side of the snows. I have 8 or 9 skins from Lassa, which offer no subject for remark.

10. *Vulpes Ferrilatus*, *Mihi*, new iron-grey sided Fox. Structure typical: size less than that of *Montanus*, but much larger than the ordinary Indian type. Possessed of the white tail-tip of the former, but not of its long and silky pelage. Fur very close, thick, porrect almost, harsher and shorter than in *Montanus*, very similar to that of *Indicus vel Bengalensis*. Inner fleece the more abundant, woolly and wavy as usual, and about one inch long; outer piles straight, elastic, and from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inch in length: Brush full, of average length, with a pelage reaching to  $2\frac{1}{2}$  inches long. Colour, above and on the limbs bright rusty, laterally, and the tail iron-grey; below and tip of the tail, albescent-rufous: the lateral and inferior hues divided on the flanks by a rufous line and on the neck by a blackish one: Ears outside concolorous with the upper surface of the animal or rusty: a vague transverse black bar across the upper surface of the tail near its base: mystaceal and other bristles long, strong, and black. Sexes alike: females smaller. Snout to rump 26 inches: Tail with the hair, 12 to 13 inches. Inner fur unringed, and of the leading proximate external hue:

outer fur quadrannulate alternately with hoary and black ; but on the ruddy black of the animal biannulate only, with blackish at the base and rusty at the tip.

*Remark.*—Possess four skins brought from Lassa ; animal common in Eastern and Central Tibet, where also *Montanus* is yet more frequent. Fur prized by the furriers.

## MUSTELIDÆ.

### VIVERRINÆ.

11. Subgenus *Viverra*. *V. Melanurus*.

12. *V. Civettoïdes*. Possess skins of both these species, brought from the Himalayan districts, but on this side the central crests or spine of the snowy region.

13. Genus *Paradoxurus*, *P. Nipalensis*. I have one skin obtained at Kootee, but this and the last two belong properly to the Zoology of Nepal and India, not of Tibet.

14. *P. Laniger*. One skin from Tingree. Its purely woolly curled and thick fur indicates its northern locale on the verge of the habitat of the genus.

### SUBGENUS MUSTELA.

15. *M. Canigula*, *Mihi*, new. Hoary-necked red Weasel ; structure typical so far as appears. Fur or pelage thick, short, moderately applied, softly elastic, with an inner or woolly addition, and a somewhat longer and laxer display on the tail, which is rather more than half the length of the animal, slightly tapered and ends in the usual pointed prolongation of the terminal hair ; colour, throughout cinnamon red, without black tip to the tail, but the chaffron and entire head and neck below hoary. Mystaceal bristles small, rigid, and of brown red hue ; average length of the longer piles  $\frac{11}{16}$  inch on the body, and on the tail one inch : average length of the shorter woolly piles  $\frac{1}{2}$  inch : colour of the latter somewhat embrowned and dusky towards the base ; but towards the tips, with the entire length of the longer piles, pure cinnamon-red, like the general external hue of the animal. Snout to rump  $15\frac{1}{2}$  inches : head  $2\frac{3}{4}$ , tail only  $7\frac{1}{2}$  ; tail and hair  $9\frac{1}{2}$ .

*Remark.*—Common in Tibet : rarer in the Himalayan region :\* pos-

\* *M. Canigula* is a new addition to the Mammalogy of Nepal ; and *Sorex Nemicola* is another, since my Catalogue was printed.

sess three specimens, the largest, above described, from Lassa. The young have the hoary colour much less developed, and the red hue duller. My specimens want the hind molars, so that I cannot positively assert whether the species belong to the subgenus *Mustela*, or to that of *Martes*, but I feel pretty sure to the former.\*

16. *M. Erminea*. Common in Tibet, where the skins enter largely into the peltry trade with China. Possess one specimen in the winter robe of the species, which is found also in the Himalaya, I hear.

17. *M. Auriventer*, vel *Kathia*. Found on the Tibetan as well as Indian slopes from the spine of the snowy region. Possess a skin from Tingree.

18. *M. Sub-Hemachalanus*. Since this species was first described, (*Journal*, July, 1837,) I have obtained several specimens from Tibet, as well as from the Himalayan districts, *cis et trans nivem*. The largest specimen is  $15\frac{1}{2}$  inches from snout to rump, head  $2\frac{1}{2}$ , tail only 6. Tail and hair  $7\frac{1}{2}$ . Planta  $1\frac{3}{4}$ . The smallest is  $10\frac{1}{2}$  inches long, and the tail 4 more, or 5 with the hair. The former is of a bright bay or brown red with labial edge; whole chin and spot on middle of front neck, hoary. Bridge of nose and last third of tail, brown black. The latter is of a deeper and duller hue or smoky brown, with the lower jaw and lips albescent; and the nose and end of tail blackish as before.†

*Remark.*—All the above Musteline animals are much prized in Tibet for their skins, which the Chinese located there cure, and in Nepal, for their ability in killing vermin, though *Auriventer* be the species most commonly so used. None are ever found in Nipal, south of the Kachar, or northern region. The belly is never white in any of the species, but deep aureous in *Auriventer* and invariably so; concolorous with the back in the rest. The pale hue under the head and neck extends with age. The fur is rather longer in *Canigula*, and the tail proportionally longer.

\* In typical *Martes* there is an additional false molar on each side of both jaws to what is ever found on *Mustela*, though the dental formula of the latter exists in a large Neilgheiry Marten, which Mr. Walter Elliot shewed to me at Madras, and of which the Zoological Society possess a specimen marked 308 a, in Mr. Waterhouse's printed Catalogue of the Society's Museum.—*Cur. As. Soc.*

† The Darjeeling *Mustela* described in my Report for January (*ante*, p. 98,) would seem to be referrible to this species, and I now think that the white mottling of the shoulders was merely the commencement of a general change to white, as in the Ermine.—*Ibid.*

19. *Mustela Calotis*. The only specimen I have, is from the interior of Tibet. It has been recently described elsewhere.\*

#### SUBGENUS MARTES.

20 *Martes Flavigula*. One specimen lately came to me from the Tibetan slopes of the Hemâchal, but the species is probably confined to the juxta Himalayan districts; for its natural habitat is the central region of Nepal, where it represents the true *Mustelæ* of the northern.

21. *Martes* (?) *Toufœus*, new, Mihi. Toufee of the peltry trade of the Chinese and Tibetans, who prize the skin very highly, next indeed to the sable. Have several fine skins from Lassa and Siling, but as they want the teeth and talons and tail, I can but conjecture from information and the specimens as they are, that the animal is a Marten. Thus judging, I should say, the Toufee has much of the size and proportions of the last or *Flavigula*; but its pelage is much richer and softer. In softness it equals the *Vulpes Montanus*, and is much fuller of fur or thicker; the longer piles being very glossy. Probable length from snout to vent 20 to 22 inches, mean height 7. Length of head about  $4\frac{1}{2}$ ; of auricle or free helix  $1\frac{1}{4}$ . Average length of the outer or hairy piles  $1\frac{1}{2}$  inch, of the inner and woolly  $1\frac{1}{4}$  inch. General colour smoky brown, darker along the spine and on the limbs, but without marks, and paled to sordid yellowish hoary on the neck and head: head palest except the mystaceal region and chin, which are embrowned: moustache moderate and dark brown. There are no rings on the outer or inner piles, which have both the general smoky brown hue of the exterior, only paler at the roots.

\* The *M. Sebirica* of Pallas, described in Shaw's 'Zoology,' I, 431, is another species which may perhaps turn up in Tibet.—I may also here notice a species which I believe to be now first distinguished from *M. putorius* viz. the Russian Pole-cat of the English furriers, which is quite a distinct species from that of Germany and Britain. I had an opportunity of comparing many very large bundles of skins of both animals at one of the Hudson's Bay Company's half-yearly exhibitions, those of genuine *putorius*, having been imported from Germany, and being quite undistinguishable from the animal of Britain. The Russian species is considerably smaller, not exceeding the Stoat or Ermine in size, with tail (vertebra) measuring  $4\frac{1}{2}$  inches or with its hair  $6\frac{1}{2}$  inches. Pelage nearly similar to that of the British Pitch or 'Pole-cat,' but apparently becoming nearly white in winter: and all the multitude of skins I saw had the pale ground-tint much whiter, and more predominating, than in the very numerous examples of *M. putorius* examined on the same occasion. This Russian species may be styled *M. putorinus*."—*Curr. As. Soc.*

22. Genus *Lutra*, L. *Aurobrunnea*. This and another small species of Otter are found in Tibet, but rarely, and the vast demand caused by the Tibetan and Chinese fancy for furs is supplied from Sylhet and Dacca chiefly, and in a less degree by these mountains, in the article of Otter skins.

### URSINÆ.

#### GENUS *URSUS*.

23. *Ursus Isabellinus*. Fragments of a skin from the further and Tibetan slopes of the Hemâchal, none from the plain of Tibet, where there are said to be no Bears. The species never wanders south of the Kachar on this side the snows, and is represented in the central region of Nipal by *Tibetanus*, (a species unknown not only to Tibet, but to the Kachar of Nipal,) and in the southern by *Labiatus*.

#### ANAPROTHERES.

24. Genus *Sus*, S. *Scophra*, tame. Pigs of the common Indian and also of one or two Chinese breeds are commonly kept and eaten in Tibet, except by the religionists. No wild ones exist there.\*

### *Ruminantes Bovinæ.*

#### GENUS *Bos*.

25. Subgenus *Bison*, B. *Poephagus*. Found in the wild as well as tame state in Tibet, where the tame ones abound, and are put to all uses. In Nepal they will not live south of the Kachar.†

26. Sub-genus *Bos*.—Bovines other than the Yak or last named, are rare in the tame state, and unknown in the wild. There are, however, three tame breeds of Cows, chiefly kept by the rich for their milk, whilst the poor Yak is the beast of burden, of agricultural labour, and of the beef market.

### CAPRIDÆ.

#### GENUS *PANTHOLOPS*.

27. *Pantholops Hodgsonii*. Common all over the open plains of Central and Eastern Tibet : never passes nor nears the Hemâchal.

\* In the country of the Usbegs, Wild Hogs would appear to be very numerous. "Descending the eastern side of the Junas Durah," writes Lieut. Wood, "our march was rendered less fatiguing by following hog-tracks in the snow; so numerous are these animals, that they had trodden down the snow as if a large flock of sheep had been driven over it." *Journey to the Source of Oxus*.—*Cur. As. Soc.*

† Wild Yaks exist on the mountains towards Yarkund; but their colour and size, as well as general habits, remain to be described.—*Ibid.*



## GENUS CAPRA, Wild.

28. *Capra Ibex*.<sup>\*</sup> Found on the Tibetan slopes of the Himalaya, and in the other high mountains of Tibet, north of Lassa and Digurchee, as well as towards the frontier of China. Have no specimen thence.

29. Genus *Capra*, tame. The shawl goats, of which there are three races, diminishing in size from the common or standard one, abound all over Tibet, almost to the exclusion of other species. The finest breed is that of Naree or Eastern Tibet, near the snowy region : but the wool is good all along the Hemâchal on both slopes, and some years ago the minister of Nepal established at Katmandoo a colony of Cashmirees to make shawls. Why not we in Kumaon, or West of it ?

## GENUS OVIS, Wild.

30, 31, 32. Three species, Ammon, Ammonoïdes and Nâhđor. All are said to be found in the mountains of the interior of Tibet, as well as on the Tibetan slopes of the Hemâchal, where, however, the Nâhđor species is the most common ; but I have lately received a fine pair of horns, with the frontlet attached, of Ammonoides vel Ammon, (*si sic decretum fuerit*,) from the same region ; viz. the Mustang district. Ammon the monster, with the monstrous horns, is, I believe, distinct and most common in, if not limited to, the Tartar regions confining with Tibet on its North. Mr. Blyth's *Ovis Burrhel* is no other than my Nâhđor, Mr. B.'s specimen of which was dyed brown by a preservative lotion that was applied by the killer and curer of it, Lieut. Smith, 15th N. I. ! !†

\* *C. Saken*, Nobis. Distinct from the Alpine Ibex, and still more so from that of Siberia.—*Ibid*.

† There is a Rowland for Mr. Blyth's Oliver, given however in all courtesie. The local Naturalist must be pardoned a smile when the Master of a Library and Museum, confounding the essentials with the accessories of species, edits a new being as unskillfully as his unprovided ally of the field department.

*Note by Mr. Blyth.*—Mr. Hodgson will, I trust, consent to suppress his smile, and thus further extend his courtesie to me, when I inform him, that I was originally induced to distinguish *Ovis Burrhel* from *O. Nâhoor*, in consequence of the decided difference in the sectional form and general aspect of the horns of these two species. I happened to be employing an artist to draw the specimen of *O. Burrhel* in the Zoological Society's Museum, when chancing to take up a frontlet of *O. Nâhoor* that was lying beside me, and holding it to the stuffed Burrhel's head, I saw at a glance that they were distinct species, and I subsequently (as mentioned in my paper on the species of wild Sheep) met with another specimen of a Burrhel's horn, wherein the specific character was equally well marked.

The ears of *O. Burrhel* are also conspicuously shorter than in *O. Nâhoor* ; and the tail appears to be reduced to a mere rudiment : it has been thought, indeed, that the

33. Genus *Ovis*, tame. Vast flocks of the graceful and valuable Hoonia are reared all over Tibet, for food, clothing and carriage, and exclusively almost of any other breed. They flourish also in the Kachar of Nepal, though not south of it, and even in the Kachar their wool degenerates. To procure the Hoonia from north-eastern Tibet, ought to be an object of zealous endeavour on the part of the Agricultural Society, which should likewise obtain the Kachar breed of the same animal, the former for export to Europe, (for it would not live in India,) the latter for attempts at crossing with the common long-tailed breed of Gangetic India. The Goats and Sheep of the Hemâchal and Tibet have the finest fleeces in the world: the Goats and Sheep of the plains of India, almost the worst.\* Should the rulers of the latter region not essay to make their apathetic subjects profit by the circumstance?

### CERVIDÆ.

#### GENUS CERVUS.

34. Sub-genus *Pseudo Cervus*, *C. Wallichii*. This species is alleged to tenant the plains of Tibet in hilly and woody situations, as well as the Tibetan slopes from the spine of the Hemâchal. But I have no further

tail of the Zoological Society's specimen had been lost, but on minute examination I arrived at the conclusion, that the whole skin of this part was present, though longitudinally divided, and what confirmed me in this belief was, the circumstance of the *pale space* that should be covered by the tail being exactly of corresponding dimensions to the size of what I judge to be the whole of this appendage; of course, I allude to the appearance as if *etiolated*, which contrasts in this respect with the colour of the surrounding parts.

Of the veritable *Nahoor*, I have seen some considerable number of horns, (there are four frontlets of males in the Asiatic Society's Museum,) but never any that I could mistake for those of the Burrhel.—Comparative figures of them are given, along with those of other species described by me, in the *Annals and Magazine of Natural History*, for September, 1841; where, however, the names are unfortunately transposed, the appellation Nahoor being affixed to the Burrhel, and *vice versâ*.

With respect to *O. Ammonoides*, Hodgson, should it really prove different from *O. Ammon*, it will be remembered that I had dedicated this animal to Mr. Hodgson himself, terming it *Hodgsonii*, some time before the publication of the name *Ammonoides*; so, likewise, Capt. Hutton's designation *Cycloceros*, applied to the wild Sheep of the Hindu Koosh ranges, and which, by the way, is equally applicable to the Corsican *O. Musimon*, must yield to my prior name of *Vignei*.

Mr. Hodgson, in his *trans-nivean* researches, should strive to procure some information respecting my superlatively magnificent *Ovis Poliâ*, to which even the "monster Ammon" yields precedence for grandeur, as it assuredly does for elegance and beauty. The only locality at present known for this fine species is the Steppes of Pamir.—E. B.

\* The Agricultural Society or any other body may command my willing services in aid of any exertions to improve the fleeces of our Indian or English Sheep.

specimen thence. That from which the original description of Hardwicke was taken, was obtained alive from Muktinath in the Himalayan region of Tibet, and considerably beyond the boundary of Nepal. Than such a habitat nothing can be more diametrically opposite to the Saul forest of the Morung, whence our *Cervus Affinis* was procured; and I therefore still believe in the distinctness of the two species, the more particularly as I conceive that the small disparity of age between the specimens compared is inadequate, even with the aid of other admitted differential accessories, to account for the vast and palpable differences exhibited by the horns. Mr. Blyth allows but about a year's difference of age between the specimens; yet the horns of *Affinis* are much more than double the size of those of *Wallichii* (as 9 to 4) whilst what he insists is the median, and I the subterminal, snag of the horns of *Wallichii*, has an interval from the basal snag as large nearly as in *Affinis*. Wherefore I say the snag in question of the horns of *Wallichii* is not a median; and that the species wants that significant mark of the true Elaphoid form.\* Lastly, Wallich's stag is known to the Nepalese by the name Gyāna Mriga; *Affinis*, by that of Mool Bara Singha, that is, chief or royal stag; and I deem it generally prudent to rely on distinctions attested by this sort of evidence.

### MOSCHIDÆ.

#### GENUS MOSCHUS.

35, 36, 37. *M. Chrysogaster*, *M. Leucogaster*, *M. Saturatus*. All these species abound in the lofty mountains of the interior of Tibet, especially towards the Chinese frontier, where the first and loveliest, or *Chrysogaster*, is almost exclusively found. On the Tibetan slopes of the Hemāchal, *Saturatus* chiefly resides, and it is difficult to distinguish this species from the *Moschatus* of Linné, belonging to the interior, otherwise than by the coarser structure of the musk pod, and inferior quality and quantity of its contents (on an average) in *Saturatus*. I have specimens of all three species from Lassa and Digurchee, whilst my garden is seldom deprived of the ornament of several live samples of the *Saturatus* of the Kachār. The trade with Europe in Musk is declining greatly of late, probably because its repute as a medicine is becoming fast exploded.

\* Mr. Hodgson should bear in mind, that the horns which he refers to are, most obviously, those of a young animal which had not assumed their typical conformation.—*Cur. As. Soc.*

Much is still sent to China, and chiefly from the Dokpa district, six stages east of Lassa. It is, *par excellence*, the Kaghaze, that is, thin-as-paper pod, and is principally obtained from *M. Chrysogaster*.

#### GENUS EQUUS.

38. *Equus Caballus*, tame. From China to Bokhara through Tibet, there are found few or no horses, but a great variety of ponies, all remarkable for their excellence for mountainous travelling. Towards and in China, the breed appears to be the smallest and highest spirited, shewing as much blood as the finest Java pony. Towards and in the Himalayan districts, there is more size and bone, but less fire. The breeds of Eastern Tibet, such as the Poomi and Gyanché, best unite the two properties of the others, or strength and spirit; whilst towards *Western* Tibet, there is a gradual increase of size till you reach the Choughosa "Cob" of Samarcund and Bokhara. In most of the Cis-Himalayan districts, likewise from Kumaon to Deo Dharma, "Hill ponies," as we call them, are bred, but none of them equal, I think, to the Trans-Himalayan races, among which I prefer that of Lassa, a smallish breed, but stronger and larger than the gallant little "China," and not materially or inconveniently less resolute or animated. The proposed Gorkha corps of mounted riflemen should, if possible, be furnished with some good breed of these ponies.

39. *Equus*, wild; *E. Kiang*, Moorcroft; *E. Hemione*, Auct.? Found generally throughout Tibet. I have no specimen.\*

\* Mr. Moorcroft remarks of this animal ('Travels', Residence at Ladakh, I. 311), that "it is certainly not the *Gurkhor*, or wild Ass of Sindh," which is the *Hemione*; see also p. 443 of the same volume for some description of this Kiang, which Dr. Gerard met with "in great herds" on the Himalaya, at an altitude of 17,700 feet; indeed it appears to be essentially a mountain animal, which "bounds up the rocks" with speed and facility; whereas the *Hemione* is rather an inhabitant of the sandy level. Col. Hamilton Smith, in his admirable treatise on the *Equidae*, (*Nat. Libr., Mem.*, XII,) conceives the Kiang to be one of several existing wild species of true Horse, and suggests that the "wild Asses" of Bell, with hair "waved white and brown," some skins of which were seen by that traveller near the sources of the Oby, may refer to no other; but this is mere conjecture, and Col. Smith appears to me to be little warranted in his endeavour to derive the pie-bald races of horses from this peculiar stock.

I may take this opportunity of remarking, too, that I entertain considerable doubts as to whether the reputed "wild Ass" of Prof. Gmelin be aught but a variety of the *Hemione*: the female observed by that naturalist had no cross-stripe over its shoulders, such as was found in the male, and is, so far as I have observed (and my attention has been long directed to the subject), invariably constant in the domestic Ass; whereas in the Mongolian *Onager*, M. Gmelin was informed that the mark

40. *Asinus Equioides*, Mihi. Species wants verification, spoken of by Moorcroft and others : called wild Ass by the Tibetans, and said to be common on the plains of Tibet. Possess no specimen.

## RODENTIA.

### MURIDÆ.

41. Genus *Mus*. Rats and mice are said to be common in Tibet, but I have no specimens, and cannot therefore indicate species.

42. Genus *Sorex*. One small species, *Tibetanus* ; no describable specimen.

43. Genus *Arctomys*, *A. Hemalayanus*. Possess many skins from the interior of Tibet, where the species is very common, and where also are found some rarer murine forms that I have no means to illustrate, such as the one adverted to by Moorcroft (I. 312). The traders of Nepal of the Newar race, who are often domiciled in Tibet, upon seeing my specimens of *Rhizomys Badius*, assure me, that this is the ordinary house rat of Tibet, and no other than the animal indicated by Moorcroft.

referred to is by no means constant (as his two specimens testified), and sometimes there is even a double cross-band over the shoulders. Now with respect to the undoubted *Hemione*, I may remark that an uncommonly fine male, which is probably still living in the Surrey Zoological Gardens, has a very distinct incipient cross over its shoulders, more developed on one side than on the other, though not above an inch or so on the former; and therefore it is probable enough, that some examples of this species may have the same mark further developed. Whether the *Khur* of Sir R. K. Porter ('Travels,' I. 459), be specifically different from the *Ghore-khur* or *Gurkhor*, i. e. the *Hemione*s of modern naturalists, remains also to be ascertained. Of this we are informed, that "no line whatever ran along his back, or crossed his shoulders, such as are seen in the tame species with us;" but "the mane was short and black, as was also a tuft which terminated his tail:" and it is worthy of notice, that this traveller completed the sketch which he has furnished of this animal from a second individual. Certes, a wild Ass, or *Hemione*, of some kind, exists at the foot of Taurus (Ainsworth's 'Travels in Assyria,' &c., p. 41); the same or another "is common in the districts of the Thebaid" (Wilkinson's 'Domestic Manners of the Ancient Egyptians,' III. 21); and a "wild Ass" is mentioned in the narrative of Lander's Expedition (p. 571); but of the genuine and indisputable wild *Equus Asinus*, we really possess no definitive information whatever, that should satisfy us of its present existence, however little reason there may be to doubt this; the *Onager* or *Koulan*, as we have seen, being very probably no other than an occasional variety of the *Hemionus*, and the *Hamar* or *Hymar* of Sir R. K. Porter, if really distinct from the last, which is very probable, being still more different from the common tame Ass, since it has no dorsal marking whatever, and the cross stripe of the so called *Onager* even was considerably less developed than in a domestic Donkey. I look to the establishment of Mr. Hodgson's *Asinus Equioides* with much interest; and indeed all the aboriginally wild Equine animals of Central Asia, if we except the modernly termed *Hemionus* alone, are but very vaguely known at present to Zoologists, and should be minutely described by whoever has the good fortune to meet with one.—*Cur. As. Soc.*

*Lagomys Nipalensis*, again, they allege to be the ordinary field rat of that strange land, *Sed quare?* *Rhizomys* is too tropical a form for Tibet.

44. Genus *Lepus*, *L. Oïostolus*. Common in Tibet near the Hemáchal, and expressly pointed out by Moorcroft (I. 225): but not so common in the central and eastern provinces of Utsáng and Khâm, as the next and much larger species.

45. *L. Pallipes*, White-foot, new, Mihi. Essential structure perfectly typical: particular conformation approximated to that of *Hibernicus* and *Variabilis*: fur very soft and full, as full as, and much softer than, the English hare, and of two sorts, the inner rather more abundant and wavy, the outer, not much longer, straight, and possessed of an uniform structure with very little rigidity, or rather with a slight elasticity and no rigidity. Size of *Variabilis*, but with ears equal to the head. General colour the ordinary hue of the English species, but paler, with less of red and still less of black in it, and the pads yet more completely enveloped in their socks: Groove of the front teeth very deep: whiskers medial, black or white. Body above, except the buttocks, with the whole toes and a list down the fronts of the limbs, pale rusty yellow or ruddy luteous, very moderately sprinkled with black. Ears outside towards the back on the distad opposed halves, with the nape, the buttocks and the limbs, bluish hoary, white almost on the ears and limbs; body below rufescent hoary; rufous on the chest and white under the chin. Ears largely tipped with black (for half an inch): Tail white. Inner fleece inannulate and bluish hoary. Outer piles triannulate with two black rings and one intervening pale rufous zone, none of these latter wholly black, nor longer nor harsher than the rest. Snout to rump 22 to 23 inches, head  $4\frac{3}{4}$ , ears  $4\frac{3}{4}$ : Oscalpis to longest toe,  $4\frac{1}{2}$ : Scut without the terminal hair, 4 inches, with it, 6.

*Remark.* Possess two skins from Lassa and one from Sikim, which however came, no doubt, from beyond the snows originally. I am indebted for it to Dr. Campbell's kindness. The species is that common to all central and eastern Tibet, (Utsáng and Khâm): but in the higher and more mountainous sites of Western Tibet, or Náree, and also in Ladakh, *Oïostolus* is the more prevalent species. *Macrotus*, or the Indian type (up to the Himalaya) never crosses the snows, nor is known in Tibet.\*

\* The *Lepus tolai* of Pallas, "an inhabitant of open hilly places in Dauria and Mongolia, and said to extend as far as Tibet," should be enquired for by Mr. Hodgson. A description is given in Shaw's Zoology, II. 203.—*Cuv. As. Soc.*







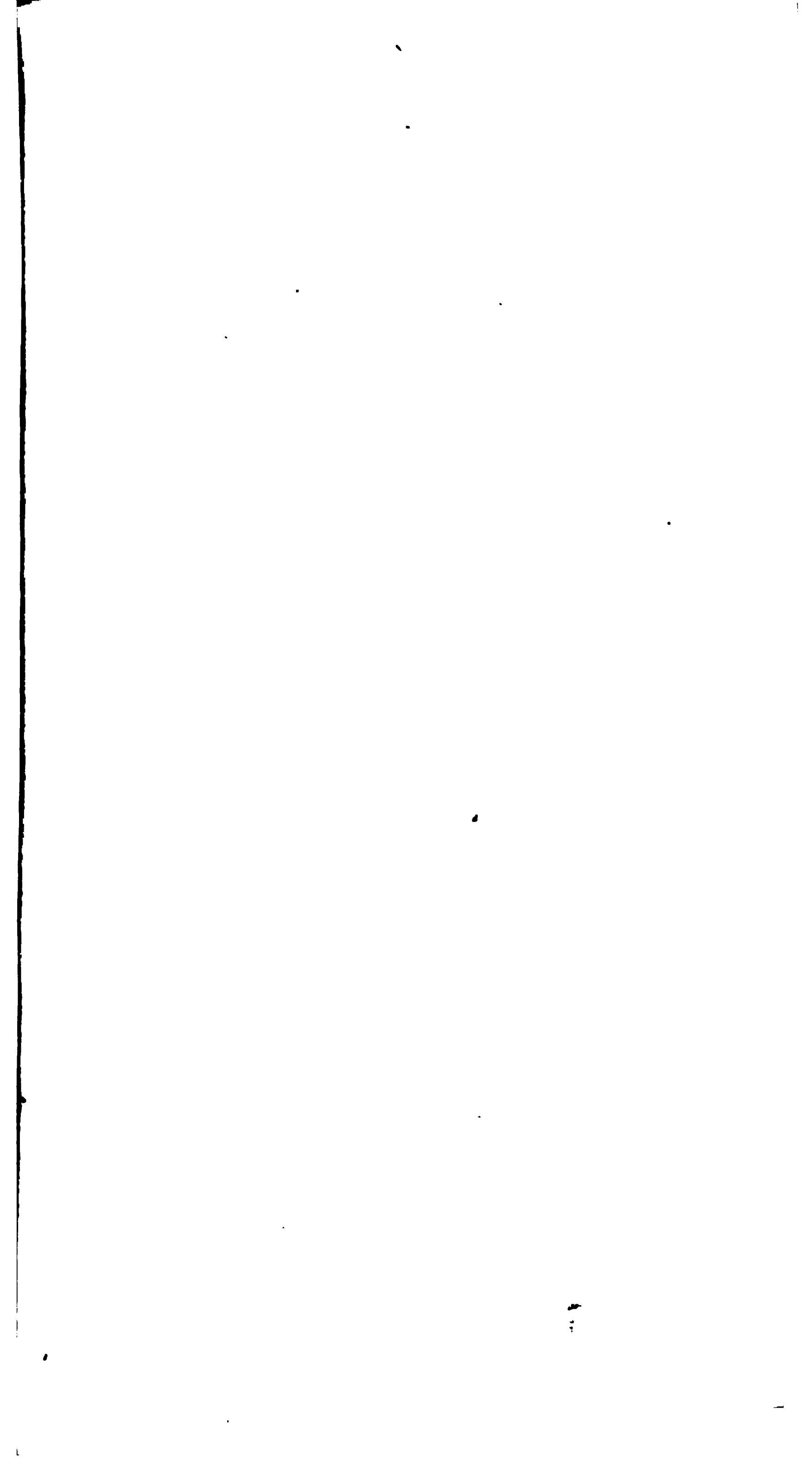




May 1888

Lepus Pallipoe. White Leg mih. Habitat Tibet

Ballou 1888







Ray Mason Smith Seal

William M. Smith Seal



46, 47. Genus *Lagomys*, L. *Nipalensis* et *Royli*. Both are said to be very common in Tibet, even much more so than in the Himalayan districts: but I have no specimens from beyond the snows, and trust to native information upon sight of the skins in my possession. The whole ground on the way from Kooti to Digurchee is said to be often covered by immense groups of *Lagomydes*, whose burrows render the roads unsafe for horsemen. The *Arctomides* collect in the same manner, but in much smaller numbers.

*Nepal, 2d April, 1842.*

N. B. Those who would consult this Tibetan Catalogue with advantage, had better first refer to the Catalogue of Nipalese Mammals, published in the last No. of the Journal.

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*Plates attached to this Paper.*

1. *Vulpes Ferrilatus*.
2. *Felis Nigripectus*.
3. *Lepus Pallipes*.
4. *Ovis Hoonia*, tame.

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*Some concluding Remarks forwarded for insertion with Capt. TREMENER's Report on the Tin Ground of Mergui.*

Of the existence of tin in considerable quantities in the province of Mergui, there cannot, from the facts above stated, be much question; and from the trial of the produce of one man's labour in a given time, there appears to be sufficient to justify every expectation of a profitable employment of labour on an extensive scale.

The places at which the trials were made, were not selected as the best from previous information, but were arrived at more by accident than design, and the stanniferous gravel and sand collected where the bed was tolerably level, stream slack, and where the greatest deposit appeared to have recently occurred.

No part of the bed of the Thabawlick, which was examined, was found wholly destitute of tin, and it is reasonable to conclude, that the ore exists in numerous spots, especially in the vicinity of the hills from which the streams arise, in far greater abundance than is shewn above.

The results, therefore, which are given in detail, can only be considered rough approximations to the quantity of tin these streams would afford, and to the probable out-turn with an establishment properly superintended. Much economy in labour might be effected in collecting the sand and gravel for the washers, but no better mode could, I think, be adopted in separating the tin in the first instance,

than by people accustomed to work with the flat conical-shaped troughs before described. The quantity obtainable, would fully repay the employment of men in this operation.

The tin, as produced by the washers, should be placed on sloping boards, and water conducted over it from a trough pierced with holes for the purpose, in order to get rid of foreign particles; and it would then, after being finely pounded, be ready for smelting. Of all metals tin is in this process the least troublesome, after the ore is freed from the earthy and silicious particles with which in other countries it is often mixed.

The crystallized form in which it here occurs, renders its separation extremely easy, and the whole processes of stamping and dressing, which in England are tedious and expensive, can thus be dispensed with. No arsenic or sulphur being mixed with the ore, it need not be roasted before it is placed in the smelting furnace.

It would thus appear that the tin of the Mergui province offers no ordinary inducement to the outlay of capital, without much of the risk, uncertainty, and large previous outlay usually attending mining adventures.

G. B. TREMENHEERE, *Capt.*  
*Superintendent of Forests, Tenasserim Provinces.*

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*Errata in the printed Report.*

Page	846,	line	10,	et passim,	for Thengdon,	read Thengdaw.
„—	848,	„	16,	for Pak chum,	read Pak chan.	
„—	849,	„	17,	for Loundoungin,	read Londamgin.	
„—	849,	„	18,	for Wolfran,	read Wolfram.	
„—	850,	„	33,	for 63-176 grains,	read 6 oz. 176 grains.	
„—	851,	„	14,	for Kohan,	read Kahan.	

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*On the Cotton called “Nurma,” in Guzerat. By A. BURN, Esq., Superintendent of Cotton Cultivation, (in reply to MR. PIDDINGTON’S Queries.) Communicated from the Secretariat, General Department.*

The plant yielding what is called Nurmah cotton in this part of the country, is the same as is described by Dr. J. F. Royle as *Glossypium Arborium*. It is to be found growing wild, I believe in different parts of India, and from some experiments I made when at Kaira, I have very little doubt that it will be found to be the original stock from whence the Barbadoes, Bourbon, Egyptian, and Sea Island varieties have originally sprung.

It grows in every kind of soil that is met with in Guzerat. But it obtains the greatest perfection in light sandy soils, to which a little old cow-dung manure has been added, and where it can have a *proper drainage*, in the black clayey soil, known as “the cotton soil” of the indigenous *G. herbaceum*; it grows, but with diminished vigour in pro-



portion to the purity of that soil. In a state of nature, and when fully developed, the seeds are nearly as large as a particle of grain, and are closely covered all round by a strongly adhering bright pea-green coloured fur, and enveloped in a fine silky wool of considerable strength, and fully an inch in length.

Hedgerows, gardens, groves of trees about the abodes of devotees and temples, are the places where this plant is found. I don't know of its being cultivated in any other way. In these places it is a perennial, lasting for four or five years or more, and being cut down to within two feet of the ground in the end of June, or a little before the setting in of the annual rains; this also is the best time for sowing the seed.

The natives appreciate this cotton, from its fine staple enabling them to spin finer thread than from any other kind with which they are acquainted. Muslins and long pugries for the head are made from it; but since the introduction to this country of European products of the loom, its use and its culture have been so reduced, as hardly at this day to afford sufficient evidence to save their being classified along with the fabulous stories of Hindoo history.

Of the quantity produced per acre, I can give no estimate; but in the first year, it could not be over 100 lbs. of clean cotton. In the second year, as the plant then comes into full bearing, it might be from three to four hundred pounds. The great extra labour and expense over the common crops, of protecting the fields during the whole year, which the cultivation of this plant would entail, is, I believe, the main obstacle to any attempts being made to cultivate it. Here we have no hedgerows, and nothing that is well calculated for such a purpose; all the agricultural produce being from annuals, the ryot protects them from cattle, thieves, &c. by living in his fields during the few months they are ripening, and which he could not do for a longer period. The price of this cotton in the bazar, is always double that of the common country article. However, there is never more than a few pounds procurable,

I have for several years back entertained great hopes in regard to this cotton, particularly that it may be improved, so as to become of value, by attending to modes of culture. That from it new varieties, suited to different soils and situations as regards climate, may be obtained, is more probable than from any of the cultivated kinds, and I have hoped that circumstances might some day admit of my being able to attempt its culture as a perennial, in the same way as cotton is grown in Peru.

Samples of the Nurmah cotton are forwarded with this letter, procured from different places in and about the city of Broach. As regards soils, I cannot at present obtain any such as could be of use to Mr. Piddington; but when I am relieved from the medical charge and duties of this place, I shall then be able to select, in visiting the country round, proper specimens.

*Broach Office of the Superintendent of American  
Cotton Planters, 6th January, 1842.*

*On an Ancient Magic Square, cut in a Temple at Gwalior. By Captain  
SHORTBREDE.*

As every thing tending to throw any certain light on the antiquities of India has an interest, I send you the following inscription of a Magic Square, which I copied last year from an old temple in the hill fort of Gwalior. It bears the date **सम्बत १५४० = A. D. 1483.**

The temple is on the northern side of the hill, and at one time it has been a very magnificent edifice, though now it be sorely dilapidated.

It has formerly suffered from the rude hands of the Musalmans, and more lately it has been excavated under the site of the image to the depth of twenty or twenty-five feet, in the vain hope of finding hidden treasure.

There is another and larger ancient temple in the fort, of a peculiar form, which the Musalmans have converted into a Musjid.

If I remember rightly, the Magic Square is cut on the inner side of the northern wall, close to where the excavation has been made. I did not measure the dimensions ; but the form is as follows :—

१६	८	४	५
३	६	१५	१०
१३	१२	९	८
२	७	१४	११

**सम्बत १५४०**

The properties of the square are, that in every way, whether vertically or horizontally, or diagonally, the sum of the numbers is 34 : the diagonals may be summed either in one line as usual, or in two parallel lines ; containing together four numbers thus :—

$$34 = \begin{cases} 16 + 6 + 1 + 11 = 3 + 12 + 14 + 5 = 13 + 7 + 4 + 10 = 2 + 9 + 15 + 8 \\ = 16 + 10 + 1 + 7 = 9 + 3 + 8 + 14 = 4 + 6 + 13 + 11 = 2 + 12 + 15 + 5 \end{cases}$$

It will be observed, that the places of the numbers 1, 2, 3, 4, form a rhomboid, as do also 5, 6, 7, 8 ; 9, 10, 11, 12 ; 13, 14, 15, 16. It may be remarked also, that the sum of every two alternate numbers taken diagonally is 17 : and that all these properties will hold good if the lines be transposed vertically or horizontally in the same order ; that is, if the top line be brought to the bottom ; or if the left hand vertical line be carried over to the right.

The whole displays considerable ingenuity, and in connection with the date, may be of use as indicating the former state of arithmetical knowledge.

8th April, 1842.

I add a copy of the inscription in our common numerals, in case it

16	9	4	5	16			
3	6	15	10	3			
13	12	1	8	13	12		
2	7	14	11	2	7	14	11
	9	4	5	16	9	4	5
		15	10	3	6	15	10
				13	12	1	8
				2			

may be wanted, as also a sample of the way in which it may be extended, which probably is similar to that in Dr. Franklin's Magical Square of Squares, but on this point I cannot speak positively, as I do not distinctly remember the particulars of Dr. Franklin's Square of Squares, and have at present no means of reference.

*Report upon the Construction of Philosophical Instruments in India. By Captain J. CAMPBELL, Assistant Surveyor General.*

It is, I believe, the intention of Government, that the proposed Madras University shall be an institution in which the principles, or even a complete knowledge, of the Physical Sciences, shall be taught to those who are willing among the Native community.

For this purpose, as apparatus for the lecture tables, and for the exhibition of the principles of machines and the various experiments in Chemistry, Hydrodymacis, Pneumatics, and the effects of Light, a set of instruments will be required, which as adapted for any institution called an University, cannot be procured at a less outlay than £10,000 at least.

It is this set of apparatus which I propose making up in India by the hands of native workmen only, at probably an outlay of little more than 5,000 rupees for the whole, and of such workmanship and

finish as to be comparable, if not as good, as the best which London can produce.

I believe no one, either youth or adult, who was at all interested in the pleasures of the pursuit of science, has ever left a lecture room in London without a secret wish, that he could himself repeat the experiments he has seen performed, and a regret that the apparatus required were beyond his means; and no one intimately acquainted with the character of Natives, and with the keen vivacity with which they regard any thing new or wonderful, will doubt the feeling of regret and humiliation with which they must regard the beautiful apparatus as finished by European workmen; while they examine a balance which takes nearly two minutes to perform a single oscillation, and wonder how it can be made to move so slow and regularly, and which is capable of rendering sensible a quantity no greater than the millionth part of the load which it sustains; when they are told that such an instrument cannot be purchased for less than 500 rupees, and that its execution is utterly beyond the capacity of the Natives of India, and that no instrument submitted to their inspection can they ever be permitted to handle or to use, and if not in affluent circumstances hardly any of the simplest can they ever hope to purchase. It may happen that the idea may strike them, that under such circumstances, what may be the value of listening to an abstract detail of philosophical facts, which they can never hope to investigate themselves, or to prove to their own satisfaction, that they are founded upon truth.

Besides this, the practical application of scientific knowledge can never be turned to account, without a familiar knowledge of the technical mode of exemplifying it.

On the contrary, how much it must assist a teacher of science in being able to fix the attention of his auditory by telling them, that there is not an article exhibited to their view, beautiful and wonderful as they at first may appear, which has not been made by Natives of India, at a price which any but the most indigent can afford, and which any one may become capable of constructing, if they pay attention to the explanation of the principles upon which the instruments have been formed.

That Native workmen are capable of this I have endeavoured to shew in a former report, and have instanced in the allusion to an in-

strument with regard to the powers of which I may mention, that Sir John Herschell, in his Discourse upon Natural Philosophy, has thought it necessary, for fear the fact should be doubted, "to assure the reader that balances have been constructed capable of rendering visibly sensible, a quantity of matter to even the millionth part of the whole;" yet this, which by the passage is evidently considered a great effort of mechanical skill, I have been able to effect by the hands of an Indian workman, totally untought, except by myself; and with regard to its outward appearance, no one who has yet seen it but has remarked, "How beautifully it is worked," or that "no one would for an instant believe that it was made in India."

It might be remarked in contravention of my propositions, that I endeavour to assert the possibility of rivaling in India the productions of the genius of Ramsden and Troughton, and that the idea is absurd; but however, such it is my intention to assert.

However preposterous the proposition may at first appear, yet it may be shewn, that there is nothing impossible in its execution, for it will at once be seen by any one acquainted with the subject, that the instruments by the aid of which the investigations by which our present knowledge of the laws of matter and unponderable substances have been conducted, owe their excellence not so much to the skill of the mechanical workman, as the ingenuity and talent in adopting means of product to the desired purpose, as shewn by those who directed the construction.

And in fact, what are the beautiful and costly instruments, the expense of which is only within the means of nations, and to which are due the proofs of the profound investigations of modern Astronomy, but large masses of metal, the true form assumed by which at each change of position, has puzzled the investigation of the most penetrating and ingenious, and has caused a competent judge to remark, "that the observations made by a circle of only 12 inches diameter are better, and more worthy of confidence than those procured by all the 3-foot circles, and even the 8-foot circle of Ramsden, which have yet been constructed," and what are the divisions upon them, but a rude attempt, (as referred to what future ages may produce), to divide the circumference into 189,600 parts, which instead of being equal parts, often differ to the amount,  $\frac{1}{5}$  of the circumferences and always to 1".

From their unimpassioned character, their slow and quiet habits, their delicate appreciation of touch, and their untiring application, it is probable that a clever Native, if once taught properly the art of dividing the circumference of a circle, might very probably surpass the best effects of the most celebrated workmen of London.

It is supposed by many, that modern discoveries in Optics have improved refracting telescopes by the lenses being better made; but such is not the fact, the lenses of the present day are not in the least better than that Galileo and Heygens were able to make, and it is probable there is hardly a Chinese workman, who does not possess a great deal more skill in polishing a lens, than the best optician in London. I once bought in London a Chinese toy, an imitation of a compound microscope, from which I took lenses so beautifully polished, as to be admired by one of the first opticians in London; and I have little doubt, that a clever workman in India could fashion lenses, with which a refracting telescope could be put together, quite as good as the best which Tully or Dolland ever made.

The above may appear a startling assertion, but no optician will deny the possibility of its being correct; for the fact is, that workmen are totally unable to give a particular required figure to a lens, and lenses of required focal distance for forming the achromatic object glasses of the best telescope, can only be procured by selecting the best among numerous failures, (whence the high price), and modern science has only improved these instruments, by teaching the proper theoretical principles upon which to compound their various parts.

In the above, it is by no means my intention to attempt to detract from the merit of the constructions of our best artists, but merely to shew, that the perfection of modern instruments is due more to the skill by which their parts are contrived and arranged, than to the mechanical skill by which the parts are executed.

It is generally imagined by Native workmen, and by many gentlemen in India, that with a pattern to copy it is easy to make any thing, this is, however, very far from correct; for unless shewn how to do it, it would be as impossible to construct the simplest philosophical instrument, as it would be to copy a telescope, or a chronometer, by the aid of a pattern only.

It is possible, besides, that the country may afford many advantages

for the manufacture of philosophical instruments, which have not yet suggested themselves to me; but among these, prominently occurs to me the opportunity of constructing a superior glass for forming the lens of telescopes, a desideratum, which in England opticians have sought in vain, from the obstacles thereto in the way by the operation of the laws of excise, while in India no obstacles of this kind exist. The materials for making the finest glass are cheap and plentiful, and it is well known, that the famous glass made by M. Ginnund, of which the great Dorpat telescope is constructed, was made in small experiments upon less than two hundred weight of materials at one time.

For making a complete set of philosophical experimental apparatus, India affords all the materials required, with the exception of glass, whence it will be necessary to purchase in London all the glass chemical apparatus for the electrical apparatus, receivers for air-pumps, and for the lenses of the optical apparatus; but as the expense of these articles at the glass-house is but little, it will form probably but a very small item in the outlay.

With the modes of executing the proposed instruments, fitting electrical machines and grinding lenses, I am perfectly acquainted, from having made them for my own use while in England, and from having had the advantage of inspecting, and using the best which have been in London, and from having had the opportunity of seeing the workshops of many of the most eminent philosophical instrument makers.

*Rayacottah, 5th October, 1841.*

*Manual of Chemistry. By Capt. J. CAMPBELL, Assistant Surveyor General, Madras.*

#### PREFACE.

This work was planned several years ago, in consequence of the difficulty which I found in procuring practical information in fitting up a small laboratory for investigations in the Chemical composition of rocks and minerals. Some parts have been for a long time compiled as a set of notes for ready reference, and have been altered and corrected, as further investigations and experience rendered it necessary. It was my intention to have published the part upon Action of Tests, but it was laid aside upon finding that the late Lieut. Braddock of

Madras, had compiled notes for a similar purpose; his death having unfortunately prevented a revision of his first valuable, though crude, little publication, I have therefore made use of his able abstract of Rose's work, with such corrections and alterations as I considered necessary, and it has been necessary to rewrite nearly the whole.

It was not my intention ever, with my present experience, to have so soon undertaken the authorship of a compilation upon the subject; but having been applied to by the Rev. Mr. Garrett, of the Wesleyan Mission, for a work adapted for the Natives of this country, who might be anxious to acquire an elementary knowledge of chemical science, and finding that Dr. O'Shaughnessy's excellent little Manual was out of print, and there being no work printed in England, at all adapted for the perusal of Natives, I have determined on commencing at once the preparation of a work adapted for the purpose.

As the labour and time required for writing a complete work of this kind would be greater than my pursuits and official occupations would enable me to spare for the purpose, Mr. Garrett has agreed to share with me the labour of compilation, and he has therefore undertaken to draw up the part descriptive of the chemical elementary substances.

While so many excellent treatises upon the different branches of Chemistry exist, no originality can be expected in a work of this kind, and it must be therefore regarded, merely as a compilation of the information from other works, abstracted, condensed, and made as practical as possible.

In endeavouring to lead the Native student on to a general view of the useful application of Chemistry, it has not been forgotten, that the subject may combine with that brief and assorted information which renders the work a "Manual of Chemistry," which will be useful, as it is hoped, to those gentlemen in India, who possessing an elementary education upon the first principles of Chemistry, are yet deterred from the practical uses of the science, by the remembrance of the extensive and costly apparatus which they have seen used by their instructors in Europe.

The Native medical practitioner will find a knowledge of this science of the utmost value in assisting him in arriving at a knowledge of the composition of the various mineral productions which the country affords, so as to enable him to ascertain what may be useful to him,



and also enable him to prepare economically and independently of the manufacture in Europe, those chemical preparations which are found so valuable in European medical science. It will enable him to correct and to apprehend the absurdity of many incongruous preparations now ignorantly made use of by Native practitioners, and understand the effects of many which are very mischievous.

A knowledge of Chemistry will enable him to ascertain the quality and properties of the juice of plants, and the decoction of leaves and bark of trees, many of which have been found very valuable in Native practice, and which afford to the skilful chemist a cheap and economical substitute for the more costly chemical preparations employed by Europeans.

It will enable him to prescribe antidotes for the frequent attempts at murder, perpetrated but too often with impunity by poison, among the Native community, upon the slightest personal pique, or feeling of revenge or resentment; but which will receive a severe check from a certainty of detection and conviction, if persons competent to examine into the circumstances were at hand.

To the European amateur, extensive opportunities for the useful and gratifying practices of Chemistry present themselves, with investigations of the mineral resources of the country. In the investigations of the properties and composition of the juices of numerous plants and trees indigenous to this country, but which in Europe cannot be obtained, except in a state of partial decomposition; and the oriental chemist has thus laid open to him a vast field of research, in the pursuit of which he may find the highest gratification, and engross to himself opportunities, which the perhaps more generally skilful chemist of Europe may envy in vain.

If his ambition lead him to seek a higher field, and measure his skill against that of European proficients, there are numerous chemical compounds which have been as yet but imperfectly examined, and upon which his analytical researches may be most usefully employed; while the extensive leisure which many of the officers in the employ of the Government possess, the cheapness of fuel and labour, may enable any one, if he is diligent and enterprising, to seize upon some of those honors which distinguished scientific knowledge has ever received in all countries.

In Europe, where the works of authors are offered for sale, the public have a right to criticise their value, and manner in which the authors have executed their task. In the present case it is far different, the purpose of the work is above criticism, the execution beneath it. The expediency of an attempt to diffuse knowledge will be denied by none, and is indeed the object of the press from which it issues. The imperfections of the execution is a necessary consequence of the limits of the work, and will be attempted to be improved, should public opinion call for another, and more extensive, and of course more expensive edition.

The practical applications of chemical science for the purpose of trade and gain are very numerous.

Carbonate of Soda can be readily and cheaply made by simply crystallizing the solution obtained by lixivating the Soda Earth, (Chour Munnoc,) of the soils of many parts of South India.

Carbonate of Potash can be made by deflagrating Saltpetre with charcoal in an iron pot, (vide description of process under head of Potash from Cocoanut Leaves, Indigo Stocks, &c.)

Prussiate of Potash can be very readily made in India, as well as in England, and as it costs there 7*d.* a pound, and the material required, and the labour are very cheap in India, and the iron pot required easily procured from England, or may be even made in India, it may be made a profitable article of manufacture, (vide description of process of Manufacture.)

Acetic Acid may be made from the decomposition of Wood, (vide process), or by the decomposition of Alcohol by powdered Platina, as Dr. Ure informs us is actually and profitably employed in some parts of the Continent of Europe, where Alcohol is cheap, in converting it into vinegar; it of course can be still more profitably used in India, where Alcohol is still cheaper. Acetate of Soda might be manufactured for importation to England, for the purpose of decomposing it for the manufacture of Acetic Acid, in case the Excise Laws in England should cause a difficulty to the import of the Acetic Acid, or in case Sulphuric Acid cannot be procured at a sufficiently cheap rate in India.

Muriate of Morphia may be readily made in India, for 1-100th part of the price in Europe, as Opium is sold in many parts of India at a very low price.

Indian Steel or Wootz, is very lightly prized in Europe, and the objection to it is the great expense required to fuse it in England, in consequence of the imperfect state in which it is manufactured by the Native workmen, who are ignorant of the principles of the process.

Sulphuric Acid may be made in India much cheaper than in England, because the Sulphur and Saltpetre required are both mineral products of this country, and of course its application in the manufacture of Nitric Acid, Muriatic Acid, and Acetic Acid. In making Chloride of Lime for use in bleaching, in dyeing, &c., and numerous others will follow of course.

Pyroxylic Spirit is another product in the decomposition of wood, which fetches a high price in England, and might be useful for producing light in India, where wood is so plentiful and cheap.

Acetate of Lead is another form in which Acetic Acid might be combined as an article of commerce, (*vide process.*)

Acetate of Alumina is another form in which Acetic Acid might be combined as an article of manufacture of great request in dyeing.

Phosphorous is a product which might be made in India, and afford an instance of the application of Sulphuric Acid.

Citric Acid is very expensive in England, being made exclusively by decomposing an Alkaline Citrate, but which might be cheaply made in India from Limes.

Citrate of Soda or Lime might be cheaply made in India, (*vide process*), and as the fruit is so abundant and cheap, could be made at less expense than Tartaric Acid.

Vinegar cheaply and readily made by the fermentation of a solution of sugar, and as the sugar is so cheap in India, the coarse inspissated juice selling in many places for eight annas per maund, which yields by fermentation — parts of vinegar of the common strength, it can be made for — a gallon.

The Pipe Clay of Arcot, and probably of other parts, affords the means of making Pottery of the finest kind in India.

The Kaolin of Mysore affords the means of making the very finest kinds of Porcelain at little expense, and may be more generally employed in making crucibles and melting pots for metals, or fire bricks for lining furnaces.

Glass also may be an article of manufacture, as the finest kinds of

quartz are abundant in South India; and soda required for a flux and wood-fuel are abundant.

Tartaric Acid may be produced as an article of manufacture by saturating the excess of Tartaric Acid in the [illegible] of the fruit of the tamarind tree with lime, (vide process,) and will be a useful article much required in dyeing; or perhaps the Tartrate of Lime might be introduced into England as an article of commerce.

Alum might be made from the Aluminous Shale said to abound upon the Western Coast.

*Prospectus.*

Part I. Introduction, Principles of Chemistry, Explanation of Nomenclature.

Sect. 1st. Chemical combination.

Modes of

Solution

Chemical mixture.

Effects of

Change of form.

Change of density or bulk.

Change of temperature.

Alteration of the action of Heat.

Change of Colour.

Sect. 2d. Affinity and tables of,

Sect. 3d. Laws of combination—Atomic.

*Theory.*

Theory of volumes.

Sect. 4th. Table of equivalents and use of.

Part II. Description of chemical elements and their properties.

Part III. Dictionary of tests.

Part IV. The use of tests, and the practice of quantitative analysis of inorganic substances.

Part V. Description of apparatus.

Part VI. Chemical manipulation, and mode of operation generally.

(Signed) J. CAMPBELL, *Captain,*

*Assistant Surveyor General.*

*Royacottah, 5th October, 1841.*

*Report of the death of Mr. CSOMA DE KÖRÖS, made to G. A. BUSHBY, Esq., Officiating Secretary, Political Department, from A. CAMPBELL, Esq. Superintendent, Darjeeling and communicated to the Society.*

It is with much regret that I report the death at this place, on the 11th instant, of Csoma de Körös, the Hungarian traveller and Thibetan scholar. He fell a victim to fever contracted on his journey hitherto, for the cure of which he would not be persuaded to take any medicines until it was too late to be of any avail.

Mr. De Körös arrived here on the 24th ultimo, and communicated to me his desire of proceeding to the residence of the Sikim Raja, and thence to Lassa, for the purpose of procuring access to stores of Thibetan literature, which he had been taught to believe, from his reading in Ladakh and Kānsun, were still extant in the capital of eastern Thibet, (Lassa,) and might have thence found their way into Sikim.

As the eldest son of the Sikim Raja is by the usage of the family a Lama, and as the present Tubgani Lama is a learned priest, and said to be in possession of an extensive library, I had some hopes that by making the Raja acquainted with M. De Körös' unobtrusive character, and known avoidance of political and religious subjects in his intercourse with the people of the countries he has visited, I might have contributed to procuring him permission to proceed into Thibet, and to this end I sent the Raja's Vakeel to visit M. De Körös, that he might satisfy himself as to the extent to which he had prosecuted his studies into the language and literature of Thibet, as well as of the objects he had in view in desiring to visit the Tubgani Lama and the city of Lassa. The Vakeel, who is a man of intelligence and some learning, was altogether amazed at finding a *Feringhee* a complete master of the colloquial language of Thibet, and so much his own superior in acquaintance with the religion and literature of that country. I endeavoured to answer his numerous questions about M. De Körös, by detailing the particulars of his early life and later travels in Asia with which I was acquainted; by stating his devotion to the prosecution of his lingual and literary studies; my certain knowledge that in permitting him to visit Sikim and Lassa, the Raja would have nothing to apprehend from ignorance of the usages and religion of the people, or an indiscreet zeal, in the attain-

ment of his objects; that he was not at all connected with the service of our government, or any other power in India; but, that the Governor General had granted him his permission to travel through India, and that any facilities afforded him by the Raja, would be noted approvingly by His Lordship and myself.

The Vakeel at my desire addressed the Raja, explaining fully my wishes, and Mr. De Körös resolved to remain here pending a reply from Sikim. He was full of hope as to the favorable result of the reference, and in the most enthusiastic manner would dilate on the delight he expected to derive from coming in contact with some of the learned men of the East, (Lassa,) as the Lamas of Ladakh and Kānsun, with whom alone he had previous communion were confessedly inferior in learning to those of eastern Thibet. He was modest and almost silent on the benefits which might accrue to general knowledge from the results of his contemplated journey, but, "what would Hodgson, Turnour, and some of the philosophers of Europe, not give to be in my place when I get to Lassa," was a frequent exclamation of his during the conversations I had with him previous to his illness.

He had arranged, in the event of his getting permission to proceed, to leave with me all his books, papers, and bank notes to the amount of Rs. 300, to be cared for on his behalf; and a complete copy of the Journal of the Asiatic Society, which he had received from the Society. He said he should ask me to keep in the event of his never returning. How soon were all his enthusiastic anticipations clouded, and his journeyings stopped for ever!

On the 6th instant I called on him, and found him feverish, with foul tongue, dry skin, and headache; I urged him to take some medicine, but in vain. He said he had suffered often from fever and other ailments, from which he had recovered without physic, that rhubarb was the only thing of the sort he had ever used, except tartar emetic. The former had been recommended to him by Moorcroft, and the latter by a Persian doctor. He took out of his box a small bit of decayed rhubarb and a phial of tartar emetic, and said, with apparent distrust in their virtues, "As you wish it, I will take some to-morrow if I am not better, it is too late to-day, the sun is going down." I sent him some weak soup, and returned to see him on the 7th. He was then much better,

got off his pallet, entered into conversation, chatted animatedly with me for an hour on his favourite subjects of thought and enquiry. For the first time since I had seen him, he this day shewed how sensitive he was to the applause of the world, as a reward to his labours and privations. He went over the whole of his travels in Thibet with fluent rapidity, and in noticing each stage of the result of his studies, he mentioned the distinguished notice that had been accorded in Europe and India to the facts and doctrines brought to light by him. He seemed especially gratified with an editorial article by Prof. Wilson, in the Supplement to the Government Gazette of 9th July, 1829, which he produced, and bid me read; it related to the extreme hardships he had undergone while at the monastery of Zemskar, where with the thermometer below zero for more than four months, he was precluded by the severity of the weather from stirring out of a room nine feet square; yet in this situation he read from morning till evening without a fire, the ground forming his bed, and the walls of the building his protection against the rigours of the climate, and still he collected and arranged forty thousand words of the language of Thibet, and nearly completed his Dictionary and Grammar. Passing from this subject, he said, in a playful mood, "I will shew you something very curious," and he produced another number of Wilson's paper of September 10th, 1827, and pointing to an editorial paragraph, desired me to read it first, and then hear the explanation. It run thus: (after noticing some communications to the Asiatic Society from Mr. Hodgson :) "In connexion with the literature and religion of Thibet, and indeed of the whole of the Bhoti countries, we are happy to learn, that the patronage of the Government has enabled the Hungarian traveller, Csoma De Körös to proceed to Upper Busahir to prosecute his Thibetan studies for three years, in which period he engages to prepare a comprehensive Grammar and Vocabulary of the language, with an account of the history and literature of the country. These objects are the more desirable, as we understand Mr. De Körös considers the recent labours of Klaproth and Remusat, with regard to the language and literature of Thibet as altogether erroneous. Mons. Remusat, indeed, admits the imperfectness of his materials, but Klaproth, as usual, pronounces *excathedra*, and treats the notion of any successful study of Thibetan by the English in India with ineffable con-

tempt." "Now I do not recollect," said Mr. De Kőrös, "that I gave my opinion of Klaproth as it is given here, but oh ! Wilson was very, very," and he shook his head significantly, "against Klaproth ; and he took this opportunity to pull him down, and favour Remusat. It is very curious ;" and he laughed heartily. Not being of the initiated in the curiosities of Thibetan literature, I did not fully appreciate the jest ; but others probably will, and I was greatly interested with the keen enjoyment produced in the mind of the Ascetic, by this subject.

At the same visit, he produced "Hodgson's Illustrations of the Literature and Religion of the Buddhists," and asked me if I had seen it ; on being told that I had a copy, and had been familiar with its contents in progress of collection, although unversed in the subject ; he said, "He sent me this copy ; it is a wonderful combination of knowledge on a new subject, with the deepest philosophical speculations, and will astonish the people of Europe ; there are however some mistakes in it." I think he then said, "In your paper on the Limboos, you asked if the appellation 'Hung,' distinctive of families of that tribe, had any reference to the original 'Huns,' the objects of my search in Asia. It is a curious similarity, but your 'Hungs' are a small tribe, and the people who passed from Asia, as the progenitors of the Hungarians, were a great nation." I replied, that as the original country of the Limboo "Hungs" was undoubtedly north of the Himalaya, and as he believed the same to be the case as regarded the "Huns," it was at all events possible, that the "Hungs" of this neighbourhood, might have been an off-shoot from the same nation. "Yes, yes," he rejoined, "it is very possible, but I do not think it is the case." And then, as if preferring to luxuriate in remote speculations on his beloved subjects rather than in attempting to put an end to them by a discovery near at hand, he gave a rapid summary of the manner in which he believed his native land was possessed by the original "Huns," and his reasons for tracing them to Central or Eastern Asia. This was all done in the most enthusiastic strain, but the texture of the story was too complicated for me to take connected note of it. I gathered, however, from his conversation of this day, and of the previous ones since our acquaintance, that all his hopes of attaining the object of the long and laborious search, were centred in the discovery of the country of the "Yoogars." This land he believed to



be to the east and north of Lassa and the province of Kham, and on the western confines of China ; to reach it, was the goal of his most ardent wishes, and there he fully expected to find the tribes he had hitherto sought in vain. The foundation of his hopes, to any one not deeply imbued with enthusiasm, or accustomed to put faith in philological affinities, will probably appear vague and insecure. It was as follows, in so far as I could gather from his repeated conversations. In the dialects of Europe, the Slavonic, Celtic, Saxon, and German, I believe, the people who gave their name to the country now called Hungary, were styled Hunger or Ungur, Oongar, or Yoongar ; and in Arabic, Turkish, and Persian works, there are notices of a nation in Central Asia, resembling in many respects the people who come from the East into Hungary. In these languages, they are styled Oogur, Woogur, Voogur, or Yoogur, according to the pronunciation of the Persian letter, and from the same works it might be inferred, he said, that the country of the " Yoogurs " was situated as above noted. There were collateral reasons which led him to this conclusion, but he did not lay much stress on them, and they have escaped my memory. It has since occurred to me, that at the time of the conversations now detailed, Mr. De Körös had some presentiment that death was near him, for on no former occasion was he so communicative, nor did he express opinions, as if he was very anxious they should be remembered. On this day he certainly did so, and I feel it due to his memory to record them, even in this imperfect manner. To give his opinions point, it would require a knowledge of the subjects on which he discoursed, to which I cannot pretend ; yet such as they are, they may, as the last words of an extraordinary man, be prized by those who honoured him for his acquirements, and admired him for his unwearied exertions in the cause of literature, languages, and history.

Although so much better on the 7th than on the previous day, I dreaded that a return of fever was impending, and I again urged him to take medicine, but in vain. On the 8th I did not see him, but on the morning of the 9th, on visiting him with Dr. Griffith, I found that fever had returned ; he was confused, and slightly delirious ; his countenance was sunken, anxious, and yellow, and altogether his state was bad and dangerous. After much trouble, we got him to swallow some medicine,

and had his temples rubbed with blistering fluid. On the morning of the 10th he was somewhat better, but still unable to talk connectedly or distinctly; towards evening he became comatose, and continued so until 5 A. M. of the 11th, when he expired without a groan or struggle. On the 12th at 8 A. M. his remains were interred in the burial ground of this station. I read the funeral service over him, in the presence of almost all the gentlemen at the place.

The effects consisted of 4 boxes of books and papers, the suit of blue clothes which he always wore and in which he died, a few shirts and one cooking pot. His food was confined to tea, of which he was very fond, and plain boiled rice of which he ate very little. On a mat on the floor with a box of books on the four sides, he sat, ate, slept, and studied, never undressed at night, and rarely went out during the day. He never drank wine or spirit, or used tobacco or other stimulants. \* \* \* \*

Annexed is a detailed list of the contents of the boxes. Among his papers were found the bank notes for Rs. 300, to which he alluded before his death, and a memorandum regarding Government Paper for Rs. 5,000, which it is stated in transcript of a letter to the Government, dated 8th February, 1842, it was his wish to leave at his death to the Asiatic Society of Bengal for any literary purpose. Cash to the number of Rupees 224 of various coinage, and a waist belt containing 26 gold pieces, (Dutch ducats I believe,) completes the money part of his effects. From this I shall deduct the funeral expenses and wages due to his Lepcha servant, and retain the remainder, along with the books and papers, until I receive the orders of Government for disposing of them. As the deceased was not a British subject, I have not made the usual advertisement of the possession of his effects, nor have I taken charge of them in the Civil Court, but in my capacity of Political Officer in this direction.

From a letter of James Prinsep's among the papers, I gather that he was a native of the town of "Pest," or Pesth, in the province of Transylvania, and I have found transcript of a letter addressed by him to the Austrian Ambassador in London, apparently on matters connected with his native country; I presume therefore, that the proper mode of making his death known to his relations, if such there be, and of disposing





by not willed by him, will be through the Austrian Ambassador to the British Court. In some documents I found his address 'Korasi Csoma Sandor.'

I have the honor to be, &c.

(Signed) A. CAMPBELL, *Superintendent.*

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may add to Mr. Campbell's interesting paper such confirmation as my knowledge enables me to give of the opinion held by the deceased philologist on the subject of the Huns, which with singular opinions on the Buddhist faith, constituted a favorite speculation. He on more than one occasion entered on the subject at great length, detailing in particular the Sanscrit origin of existing place names and hill ranges in Hungary: my constant request at the close of our conversations used to be, that he would record these speculations. He invariably replied darkly to the possibility of his, one day, having it in his power to set the world something sounder than speculation. In proportion as I pressed the subject, he became more reserved with me on these particular questions. I never had an antipathy to his opinions being published. I remember his one day a quantity of curious speculation on the derivation of geographical names in Central Asia. Some months afterwards, I had occasion to annotate a list of the nomenclature of the Oxus, and writing to him, recapitulated his views on the subject, and begged to be allowed to publish it by authority. His only objection was "that he did not remember." His exceeding diffidence on subjects on which he might have dictated to the learned world of Europe and Asia, was the most striking feature in him. He was very deeply read in general literature, independently of his own lore; but never did such acquirements centre in one who made such use of them.



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*to accompany a Map of the Isle St. MARTIN'S. By C. B. GREEN-LAW, Esq., Secretary to the Marine Board.*

Some time since the annexed map of a Survey of the Island of St. Martin's, south of the River Naaf on the Arracan Coast, has been forwarded for publication in the Journal. It is by the late Mr. Frederick Bedford, who commanded a schooner employed on that Coast for the purpose of suppressing the trade in salt smuggling.

The Survey of this and other islands and places on the Coast, formed part of the established duties of Mr. Bedford's office, but he undertook and executed them with a zeal and spirit that won for him the high opinion of his immediate superiors in the province, and with an ability which would assuredly have obtained him the future support and

countenance of the Government, had he lived to carry on the further surveys which were in contemplation.

Unfortunately, however, the *Osprey*, the beautiful schooner which he commanded, was lost on the night of the 15th of November last in a gale of wind.\*

The survey of St. Martin's Island, however, formed but a small portion of what he had already performed. He made a similar survey of Oyster Island, and of the mouth of the Myoo River, and his maps and charts formed part of a lengthened Report from the Commissioner of the province, Captain Bogle, on the propriety of establishing a regular chain of lights on the coast. I have no purpose, however, to go into that extensive question, although in connection with the increasing prosperity of the province, arising from its rapidly increasing growth and export of rice, as also with the consideration of the probable eventual establishment of a naval port at Kyouck Phyoo, it is an interesting, if not an important question.

My present remarks are necessarily confined to St. Martin's Island, and in addition to what is stated by Mr. Bedford in the sketch itself, in respect to the nature of the soil, I am enabled to add the following from the Commissioner, who says, I think justly, that this Island appears to be capable of being turned to profitable account.

Captain Bogle, after adverting to Mr. Bedford's remarks on the best position for a Light House, observes,

"It is not only as a light house station that this Island appears to be deserving of attention; as a Sanatorium for the people of Calcutta, it would I have no doubt be found invaluable; it cannot be at all subject to the evils of the climate of Arracan, for it is too far north, and is besides six miles from any land; it is about four miles long by one mile broad at the north end; it has plenty of excellent fresh water; turtle, and doubtless oysters abound; the sea around it supplies large quantities of the finest fish; the soil is in part excellent, probably well adapted to the growth of vegetables; it possesses some pretty undulating scenery, the northern portion of the Island being a perfect park; there is space

\* It appears that the *Osprey* left the Naaf on the 15th of November, and has not since been heard of, but as a sudden and severe gale occurred during the night, there is no doubt she foundered. He himself had only on the 9th of the same month written, that she was as fine a craft as could be, and that he considered her equal to any service.

for ten or twelve bungalows with compounds, as well as for Natives' houses. The beach affords a beautiful ride and splendid sea-bathing, and in the N. E. monsoon, the climate is superlatively fine, as it must also be in the months of March, April and May, when the sea breeze blows most refreshingly ; in short, it is described as a very agreeable Island, and one which owing to its proximity to Calcutta, and its remoteness from external evils and temptations, might possibly be found a most admirable location, not only for the higher classes, but for European invalid soldiers."

I can add nothing to this very interesting, though simple notice of Captain Bogle, beyond the expression of my hope, that some parties may be found sufficiently enterprising to make trial of the capabilities of the Island, bearing in mind, that there is a regular established intercourse between Calcutta and Arracan by means of the *Amherst*, and that therefore there would always be periodical opportunities of coming and going ; add to which, it is to be hoped, that another vessel will shortly be sent to take the place of the ill-fated *Osprey*, which by her visits would help to enliven the place, and add to the means of communication.

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*On the Cotton called " Nurma," by Dr. IRVINE, Residency Surgeon at Gwalior. Communicated by COLONEL SPIERS, Resident at that Court.*

I have the honour to forward to you the result of my inquiries regarding the Nurma cotton, which I have only now been able to complete. I send the information I have obtained in the form of question and answer.

I beg to call your attention to the fact, that Nurma is the name applied to this cotton by the Mussulmans only ; and that the real name from time immemorial is "*Barari*," and that it is in all probability indigenous. The Nurma is not produced as a crop at Chanderee, but is imported as required from Cholai Muhasur on the Nerbudda, where it is regularly cultivated.

A few years since, an experiment was tried at Chanderee of growing the Nurma cotton, but as the cotton yielded was not so good as that imported, and as insects and frost injured the plants, and as the cotton adhered very firmly to the seed, the ryots at once gave up their inten-

tion of cultivating the Nurma plant. This abandonment seems to have been very premature; as it is most likely that a little more care and perseverance would have insured success. The present demand for Nurma cotton is, however, so very small, the trade in fine Mamoodies being little or none, that no encouragement is afforded to the cultivators. The present supply of Nurma cotton from Cholai Muhasur at Chanderee has been five years in the godowns there, and is far from exhausted, and can be had there at three seers per Chanderee rupee.

It will be observed, that the Nurma cotton is naturally of a dirty yellowish colour; it is also gathered very carelessly; the wool adheres strongly to the seed; and the fibre though fine, is not long in the staple. It is vastly inferior to Sea Island cotton in every respect.

I take the liberty of sending another specimen of common American cotton grown by me at Gwalior last rains. This cotton, it will be seen, is finer, and in every respect better than the Nurma cotton; the Chanderee people themselves say so, and this common American cotton can easily, under proper treatment, be introduced into India. The Nurma cotton can no doubt be spread over the country in suitable places; but it will never equal the American cotton. The fineness of spinning is no criterion, as the invisible thread of Chanderee has been far surpassed by the Manchester machine spinning, where one pound of the best cotton has been extended to 8 skeins of 180 yards each, but this degree of fineness is not a desideratum in England, and has been effected only as a curiosity.

The labour, delay, and expense of the Chanderee Mamoodie manufacture of any degree of fineness is exceedingly great. The finest Mamoodie piece of five yards costs Chanderee rupees 100; the breadth being only half a yard, while for this sum ten pieces of fine Scotch Cambric can be purchased even up-the-country of beautiful even texture, 7 yards long and a yard wide.

The greatest trouble and time is taken in collecting skeins from the different spinners of equal fineness.

*1st Query.*—What is the kind of cotton called Nurma; is it of this country or foreign; and if foreign, in what way has it been introduced; who brought the seed first, and from what country?

*1st Answer.*—Nurma cotton is foreign according to universal belief at Chanderee; has always been brought to Chanderee from Cholai Ma-



hasur beyond Kidore on the Nerbudda; the best *Nurma* cotton is alone brought from that place. The Chelai Muhasur seed has on one occasion been sown at Chanderee as an experiment, and though the cotton produced was fine, it was not at all equal to the real *Nurma* cotton of Chelai Muhasur. The inhabitants of Chanderee have no idea of the time of the introduction of *Nurma* cotton into India. For the last 25 years, the present fineness of thread has been spun; formerly the thread spun was so very fine as to require a blanket on the ground moistened to receive it as it came from the wheel, when the thread was scarcely visible; and it is said, that a skein placed loosely in a saucer of water, might have been drank unknown to the person swallowing it. Mussulmans and Hindoos of all classes equally employ themselves in spinning this cotton. *Nurma* is the name given by the Mussulmans; the real name from time immemorial is "*Burari*," which would indicate Berar as the original country of this cotton; or the word may have arisen from the cotton drawing easily out into a thread, from "*burana*," to draw out.

*2nd Query.*—Is *Nurma* cotton produced in the common fields, or does it require peculiar ground and treatment?

*2nd Answer.*—*Nurma* cotton has always been imported into Chanderee, and has only once been sown there about five years ago. The *Nurma* seed was sown at the villages of Keerawul and Sersode, four miles from Chanderee; the cotton produced was not so good as that of Chelai Muhasur, the crop was besides injured by insects, the ryots therefore did not sow it again. It appears, however, evident, that the *Nurma* cotton would succeed about Chanderee, but there being very little demand, there is no encouragement. At present Chelai Muhasur supplies amply more than is required at Chanderee. As stated, three beegahs were sown at Keerawul, and two beegahs at Sersode, and the cotton produced, though fine, was like common country cotton in adhering firmly to seed, and hence was rejected by the spinners. The soils at these villages are light brown loams. In these native experiments, the *Nurma* seed was sown in the same way as the common country cotton. After the first rain in June, the ground was ploughed, then allowed to imbibe a heavy shower, the seed was then sown, then harrowed with the wooden "*putela*," then exposed to a few days' rain, after which the young plants were weeded by the hand, the

ground was then hoed, after which common manure was spread over the field by the hand amongst the plants, the weeding and hoeing were repeated at intervals several times. The crop was nearly destroyed by small insects, and by frost. The Nurma cotton produced at these villages on this occasion, required the seed to be separated from the cotton by the *charkee*, or rollers; while the seed of real Nurma cotton from Cholai Muhasur is easily and immediately separated from the seed, merely by rolling it lightly with a wooden pin, or by picking it with the hand.

*3rd Query.*—Do the natives largely manure the fields for Nurma cotton; and is a peculiar manure used?

*3rd Answer.*—This I have written to inquire at Cholai Muhasur.

*4th Query.*—At what season is Nurma cotton sown, and in what manner; when is the crop ready, and after gathering, how is it cleaned?

*4th Answer.*—After the first fall of rain in June, in the same method as country cotton. The crop is gathered about October or November at seven or eight intervals, according to the favourableness of the season, and is cleaned by the hand, or a small wooden rolling pin. The cleaning is evidently very much neglected, as the Nurma cotton is brought from Cholai Muhasur in the same dirty state as the specimen sent. Before spinning, the Nurma cotton is pulled out for six hours by the fingers, and then is drawn out and dusted by a small apparatus, (or "*pinjurs*," ) of a catgut thread struck by a mallet, and is then rolled on small sticks, from which it is placed in paper sheaths to spin off, each sheath having a leather wrapper to give a firm hold, and also to prevent the perspiration soiling the contained cotton. It is spun by very small wheel, having a very fine spindle.

*5th Query.*—What is the price of the best Nurma cotton, and to what country is it exported?

*5th Answer.*—Formerly as there was a great demand at Chanderee, and as the supply from Cholai Muhasur was in a degree limited, the Nurma cotton cost Chanderee rupee 1 per seer; now the demand has so greatly fallen off, that three seers can be had for the same sum. This cotton is alone imported to Chanderee from Cholai Muhasur; it is not known to be imported into any other place; for several years Nurma cotton has not even been brought to Chanderee; the finer cotton Mamoodies being in very little demand, the trade has vastly diminished. Rich

natives only make inquiries for this fine cloth, which is sold in a very few shops. The Nurma cotton of which these Mamoodies are now made, has been in the Chanderee godowns for five or six years past, and does not spoil by keeping.

**6th Query.**—How many years does the Nurma cotton remain in the soil?

**6th Answer.**—One year only.

**7th Query.**—What soils are deemed the best for the Nurma cotton? Specimens of the soils are required.

**7th Answer.**—The light brown loams are deemed the best cotton soils. The Sersode soil is only sent; one specimen from the surface; one from 8 inches deep; one from  $1\frac{1}{2}$  feet deep.

**8th Query.**—The nature of the soils and minerals around the cotton fields?

**8th Answer.**—These specimens for reasons stated have not been brought.

**9th Query.**—Are the Nurma cotton fields watered or not; and if watered, how often?

**9th Answer.**—They are never watered, being left solely dependent on the rains.

**10th Query.**—When the Nurma cotton plants are about to flower, are the tops broken off or not?

**10th Answer.**—The plants are always left in their native luxuriance.

**11th Query.**—A specimen of Nurma cotton is required.

**11th Answer.**—The specimen of Nurma cotton is one imported at Chanderee from Cholai Muhasur; there is also a specimen of the deteriorated Nurma cotton from seed, as stated, sown at Chanderee.

**12th Query.**—When the Nurma crop is ripening, is the plant liable to disease?

**12th Answer.**—The Nurma plants produced at Chanderee were much injured by insects and by frost. The insects were like those moths that destroy woollen cloths.

**13th Query.**—When the fields of Nurma cotton produce plentiful crops, what tax is paid per beegah?

**13th Answer.**—From eight annas to one rupee a beegah, as for other crops.


**14th Query.**—At Chanderee how deep are the wells, and in what stratum is water found?

**14th Answer.**—About forty cubits deep the water is found in sandstone: the water is excellent.

**15th Query.**—Specimens of the thread of which the fine Mamoodies are made are required?

**15th Answer.**—Two skeins or "*pucheries*" of the thread are sent, the finest weighs  $2\frac{1}{2}$  mashas, and costs 4 annas; the coarser weighs  $2\frac{1}{2}$  mashas, and costs  $3\frac{1}{2}$  annas; one of these "*pucheries*" cannot be spun in less than four days. They are spun by all parties, and when collected, are arranged according to their fineness.

GWALIOR, March 17, 1842.

NOTE.—My readers may recollect, that "Nurma" cotton from the neighbourhood of Herat, was one of the samples of the staples of trade between Sindh and Khorasan, and that "the foreign origin" of the Nurma grown in Bundelkhund was then accounted for by me by the natural supposition, that the fine cotton was brought into the country by the early Mussulman invaders; an opinion which I still adhere to. 

*On a Cylinder and certain Gems, collected in the neighbourhood of Herat  
by Major Pottinger. By the EDITOR.*

I have selected the gems figured in the annexed plate from among a collection placed in my hands by Major Pottinger. The cylinder (Fig. 1,) is a very curious relic indeed. It was found on the hills close to Herat by an Eimauk woman, from whom, I believe, Major Pottinger purchased it. The material of which it is composed, as well as the figures, and Cuneiform characters upon it, having equally baffled conjecture and ordinary investigation, I sent the impression, taken in sealing-wax, to Major Rawlinson at Candahar, requesting him, acquainted as he is with some of the forms of the Cuneiform character, to give me his opinion upon it; while I applied to my friend, Mr. Piddington, now Curator of the Geological branch of the Museum of the Asiatic Society, to determine, if possible, the material of which the cylinder was composed. His opinion, in which Professor O'Shaughnessy concurred, was given me as follows:—

"At the request of our Secretary, I have examined this precious relic as to its physical properties. Its dimensions are,

						Inches.
Height,	..	..	..	..	..	1.1
Diameter,	..	..	..	..	..	0.5
Diameter of the hole,		..	..	..	..	0.2

“The hole is not drilled through the exact centre, and, as may be seen by looking into it, has been drilled from opposite ends. Its hardness is very considerable, as a good file will scarcely touch it. It is magnetic, but not strongly so, and its spec. grav. by two trials at a temperature of 82° is 4.97. Neither nitric nor muriatic acids produce any effect on its surface. Its colour is a dark black grey, with minute shining specks, (probably of magnetic oxide of iron or mica,) only seen in a strong light, or by a magnifier.

“As it is by far too valuable to take even the minutest portion for a blowpipe analysis, I am deprived of any farther means of ascertaining what it can be. Its high specific gravity places it far out of the class of basalts, to which it would at first be referred on a cursory inspection; and its hardness out of the magnetic iron ores. I am inclined to think it a ferruginous titanite, analogous to that described by Klaproth from Aschaffembourg, in Silesia. Perhaps, though not exactly a physical property, I should not omit to remark the admirable sharpness of the characters, which it is doubtful any metallic tool could have produced.

“I add here from the London translation of 1801 of Klaproth’s Essays, p. 504, the chemical characters of his fossil :—

‘*Colour*.—Iron black, accompanied outwardly by a moderate, inwardly by a stonger, metallic lustre.

‘*Fracture*.—Uneven and of a fine grain; fragments indeterminately angular.

‘*Hardness*.—Very brittle and hard, and only with difficulty ground to a subtle powder, which is black.

‘*Specific Gravity*, 4.74.—(This was probably at 60°.)

‘*Magnetism*.—Not attracted by the magnet even in the small splinters, nor does it attract the least particle of iron. The more remarkable is it, therefore, that it attracts and repels the poles of the magnetic needle, or any moveable magnetic bar.

‘*Composition*.—Oxyde of Iron, 78. Oxyde of Titanium, 22=100.’

“So far Klaproth. I may add, that the degree of magnetism which he here describes, is that which our cylinder also possesses, and which is now well known to be merely an inferior degree of the same element.”



The character Major Rawlinson informs me, is the third, or mixed order of the Cuneiform writing. He supposes the inscription to express some formula of prayer, or adjuration. The cylinder being evidently an amulet to be worn suspended round the neck, or the arm, or perhaps


on a string round the middle, as with the amulets of a somewhat similar shape worn by children in this country, his conjecture is in all probability correct. The figures and emblems on the cylinder have yet to be explained. The man holding a dagger, is perhaps in the act of binding himself to some compact, religious or civil, the conditions of which are expressed in the inscription in the presence of a priest, some emblem having reference to the rite, being apparently the image of a bird, being set up between the two? Or is the supposed priest in the long striped robe a female figure? I have taken much pains to arrive at even a plausible conjecture respecting the upright emblem, as a clue would be readily found to the meaning of the whole, could this type be traced. All I can say on the subject is, that such an emblem is figured in Rich's Memoir on the Ruins of Babylon, in No. 1. *a.* of the plates which illustrate that interesting notice. "No. 1," says Mr. Rich, "is a black stone of an irregular shape (in part broken and defaced,) about one foot in length, and  $7\frac{1}{2}$  inches in breadth. 'The figures on it *a* and *b*, have been supposed to represent the Zodiac of the Babylonians ;' an inscription is partly legible, I should observe, on the stone, written in the first form of Cuneiform writing. The figures on the stone (*a*) are those of a dog, or wolf, and of a bird seated upon a staff or rest, set upright in the ground. The shape and attitude of the bird would incline one to conclude that the artist intended to represent a crow or raven. The idea that the emblem is Zodiacal, is, I think, borne out by the nature of the figures on (*b*), the other part of the same stone, which represent an antelope, a human head with ram's horns, an altar, two human figures, and others which are indistinct. I am more impressed with the theory of the Zodiacal character of the *bird* emblem, from having found it with other similar figures, in a plate Vol. II. of Kerr Porter's Travels.

I have by me drawings by the late Edward Conolly of several similar rude figures of birds, of which he gave me the following notice: "These are from Seistan; these small copper images are however found in the ruins of old cities in all parts of this country, and have been dug out of topes." Mr. Rich observes, "small figures of brass or copper are also found at Babylon:" (?) of a similar description with the above. (?)

This suffices to establish the fact, that such an image as that figured on the cylinder, was for some purpose as yet unknown to us, but having reference, probably, to a religious rite, in common use among the ancient

Parthian (?) inhabitants or invaders of Khorassan. Even this meagre index to a solution of the meaning of the type might give an able antiquary the means of following up the investigation with success.

The cylinder, figured No. 12, in Rich's Memoir of the Rains of Babylon, differs from that before us as respects the inscription, but with regard to the human figures, is precisely the same. The priest in the striped robe, with his arms raised in the manner (vide Kerr Porter's Travels,) depicted on many of the ancient Persepolitan sculptures, the man with the dagger, as if in the performance of a rite, are exact in the one as in the other ; the emblem between these figures is however different from our's ; it is also  differently placed, and not as standing on the ground ; it is in this shape, while the indistinct emblem, which is given in our's  above the heads of the figures, is replaced in Rich's by a directly solar type, as I conceive it to be.

 This variation in the emblems may account for the inscription of a different written formula. Mr. Rich's brief notice of these curious relics, I extract for readier reference.

"The Babylonian cylinders are among the most remarkable and interesting of the antiques. They are from one to three inches in length ; some are of stone, and others apparently of paste, or composition of various kinds. Sculptures from several of these cylinders have been published in different works ; and Nos. 10, 11, 12, 13, and 14, are specimens of my own collection. Some of them have Cuneiform writing on them, (as Nos. 12 and 13,) which is of the third species ; but has the remarkable peculiarity, that it is reversed, or written from right to left ; every other kind of Cuneiform writing being incontestably to be read from left to right. This can only be accounted for, by supposing, that they were intended to roll off impressions. The cylinder No. 11, was found in the site of Ninevah. I must not omit mentioning in this place, that a Babylon cylinder was not long ago found in digging in the field of Marathon, and is now in the possession of Mr. Fauvel of Athens. The cylinders are said to be chiefly found in the ruins of Jerbouiya. The people of this country are fond of using them as amulets, and the Persian pilgrims, who come to the shrines of Ali and Hossein, frequently carry back with them some of these curiosities."

Having done my best to offer some explanation of this curious relic, I have, *with inexpressible regret* to state, that it is no longer in my posses-

sion ; a friend to whom I entrusted it, for the purpose of examination, having mislaid, or lost it.

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My readers will at once detect on Fig. 2, characters similar to those of Conolly's gem of *the hand and ear*, noticed by me in No. 122 of the *Journal*, and of other gems already published in this *Journal*. They are boldly and elegantly cut, as are also the wild goat's head, and the palm leaves (?) which complete the device. The gem is on basalt, which has been cut down to form a surface for the execution of the carving. The whole has then been roughly polished, and the stone drilled, to allow of a string or ribbon being passed through it. The perforation so made, is about a third of an inch in diameter, and is cut in a clean and workmanlike manner. Its large size, compared with that of the gem itself, is perhaps indicative of the value attached to the amulet, its wearer being desirous of securing it by as strong and thick a ligature as possible ? I conjecture the device to have some planetary allusion. Might one suppose it zodaical, and detect Capricorn in the goat's head ? It is given in its full size in the plate, but without a side view, which would have shewn the perforation, and the whole bulk of the gem.

No. 3.—Is on crystal, the head Sassanian ; a variation of the characters (?) the execution good.

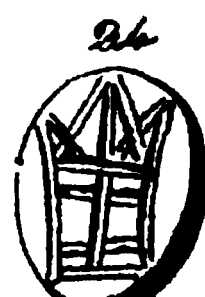
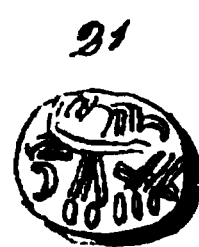
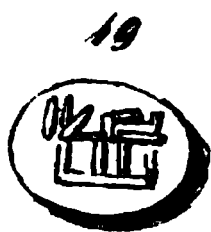
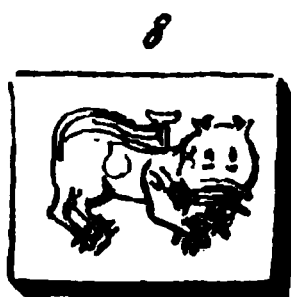
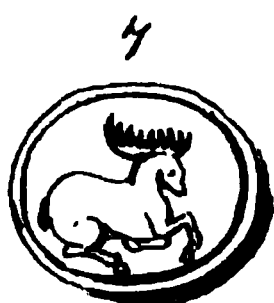
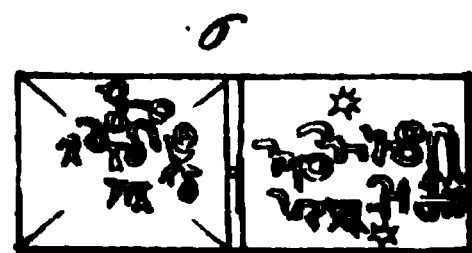
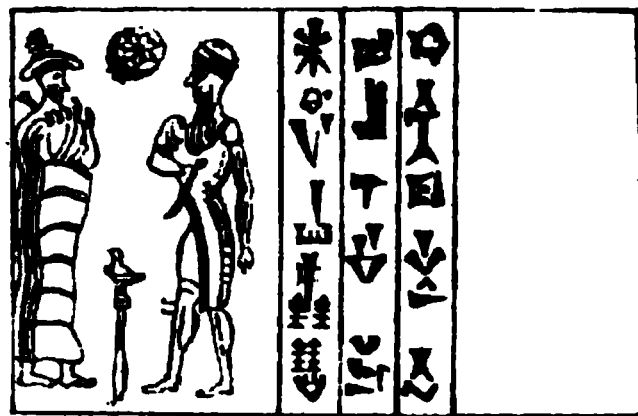
No. 4.—Red cornelian, a man driving before him a humped bull. The characters are indistinct, and the execution coarse : the reverse of the gem plain and highly polished.

No. 5.—Sardonyx, the characters similar to those of No. 2, and beautifully executed. I fail, however, entirely to make out what the central object is intended for ; a conch shell ? This stone by its shape and size, appears to have been intended for a seal ring.

No. 6.—Red cornelian, it is carved on both obverse and reverse, and carefully polished : the former slightly convex, the latter flat. The character is evidently the ancient form, used for the earliest Pali inscriptions. My Pundit, Sarodha Prasad, professes to read the reverse in Pali, **महामहिमगसमादेश** which rendering Pundit Kamala Kanta concurs in. The obverse is perhaps the abbreviated form of some ordinary mandate, as the characters appear arbitrary, and the meaning of the reverse, (as read by the Pundits,) *maha mohe maga samadesa*, carries out the inference, it being, "command of him who is first in dignity." (?) I give the







reading (*quantum valeat*) on their single authority. If it is a correct one, we have before us the signet of some bye-gone potentate, who used it to authenticate his written orders.

In the numbers which follow, I have given specimens of the ruder and *unlettered* gems found in numbers in Khorassan, as in the upper part of the plate are shewn various descriptions of *lettered* gems from the same quarter, giving inscriptions in *three*, if not *four*, of the forgotten languages of the earth.

No. 7.—Pink cornelian : it is roughly polished, and drilled for threading. The subject, a stag with branching antlers, is perhaps the commonest among the devices on such gems. Nos. 10, 14, 17, and 22 give proof of it. A solar type is perhaps intended.

No. 8.—Red cornelian : a lion very coarsely cut, the stone however is carefully shaped and polished.

No. 9.—Crystal : the subject (?)

No. 10.—Fine red cornelian, highly polished ; apparently a flower.

No. 12.—Red cornelian : a humped bull ; this stone is rudely perforated.

No. 13.—Crystal : a horse rudely cut on the convex side of the stone.

No. 14.—Pink cornelian.

No. 15.—Ditto, the stone rudely perforated : the subject (?)

No. 16.—Ditto : a bull.

No. 17.—Veined brownish cornelian : the stone has been ground down to form a surface, and is roughly perforated.

No. 18.—Serpentine : a mounted horseman.

No. 19.—Crystal.

Nos. 20, 21, 22, 23.—Red cornelian : all these gems are merely given as specimens of the rude emblematic devices found in numbers about the sites of ancient cities in Khorassan.

No. 24.—Is a lump of white agate, rudely ground down in one place for the reception of the device, and as rudely perforated. A *Jotee*, or Jain priest, who saw this gem, professed to recognize a Buddhist emblem in it, declaring it to be the conventional mode of representing the *sruthi* *thapani*, or desk-frame from which the Buddhist scripture is read : he brought me an ancient Pali illuminated inscription to prove his assertion, by pointing out to me a similar device ; but by no means succeeded in convincing me of the resemblance. The supposition is however perhaps worth mentioning.

*Museum of Economic Geology of India.* By H. PIDDINGTON, Esq.

SIR,

I am authorised by the Committee of Papers of the Asiatic Society, to forward to you the accompanying Memorandum relative to the MUSEUM OF ECONOMIC GEOLOGY OF INDIA now forming, in the confident hope that you will personally, and through your friends, kindly assist their views and those of Government, as far as lies in your power.

With respect to carriage of Specimens, such small ones as may not exceed the usual dawk banghy weight, say 500 Tolas, may be sent at once, addressed to the Secretary of the Asiatic Society, and those above that weight dispatched by the nearest water carriage, preferring the Steamers if obtainable. I am, Sir,

Your obedient Servant,

H. PIDDINGTON,

Curator, Mus. Econ. Geology of India.

CALCUTTA,

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The objects of the Museum of Economic Geology of India, which has been established by Government at Calcutta, under orders from the Hon'ble the Court of Directors, in conjunction with the Asiatic Society and at its Rooms, are the following: They are, as scientific men will perceive, generally those of Economic Geologists in all countries, but there are some peculiarities connected with India, and the situations of Europeans in it, which will oblige us to go into a little detail, to explain to those who may not already take an interest in these matters, our wants, our wishes, and our hopes of the advantages which may accrue to the community from this new establishment. Its objects then are briefly these:—

1. To obtain the most complete Geological, Mineralogical, and Statistical knowledge possible of all the mineral resources of India, wrought or unwrought, so as to make them as publicly known as possible; to shew how they have been, or are now wrought, or how they might be so to the best advantage.

2. To obtain a complete set of specimens, models, and drawings, relative to the Mining operations, Metallurgical processes, and Mineral manufactures of all kinds, of India and of Europe and America; so as to afford to the public information of every thing which can be turned to account here or in Europe, and perhaps prevent loss of time, waste of capital, and disappointment to the Indian speculator.

3. To furnish the Engineer and Architect with a complete collection of all the materials, natural or artificial, which are now, or have formerly been used for buildings, cements, roads, &c. and of all which may possibly be useful in this department, whether European or Indian.

4. To collect for the Agriculturalist, specimens of all kinds of soils remarkable for their good or bad qualities, with the subsoil, subjacent rocks, &c. and by examination of these, to indicate their various peculiarities and the remedies for their defects.

5. To collect for Medical men, the waters of mineral springs, mineral drugs, &c. &c.

6. And finally, by chemical examinations of all these various specimens, to determine their value, and how they may be best turned to account for the general benefit of the community.

With objects like these the Museum of Economic Geology may be said to be placed between the purely scientific geologist and the merchant, the miner, the farmer, the manufacturer, and the builder, or in other words, the merely practical men, who may desire to know how the knowledge of the geologist and mineralogist,—to them often so recondite, and apparently so useless,—can forward their views: and its office, to be, if possible, to answer all questions of this nature which may arise, for public benefit.

This may sometimes to be done from books, but the great library must be the collections of our Museum, which are in fact a library of examples, to which the commentary is the laboratory; where, aided by the resources of the collection, questions may often be solved in an hour, a day, or a week, which it would take half an *Indian* life to obtain the mere materials for investigating. An extensive collection, then, is the first requisite, and this should, if possible, comprise every inorganic product of the earth from which mankind derive any advantage, with every information relative to it. It will readily occur to the reader, that in India, owing to her infancy in some of the arts dependant on these products, as in mining, agriculture, &c.; and her singular progress in others, as in peculiar branches of Metallurgy and the like, our almost absolute ignorance of what her methods and resources are, the peculiarities of situation in which these resources may exist, those of climate, workmen, and many others, we have almost every thing yet to learn; and that to accomplish our objects, we cannot be too well furnished with all the knowledge and examples of Europe and the Americas, and all those of India, or of Asia. Without these, our progress must be very limited; but in proportion as we obtain them, we may hope, without presumption, to see the day when the mines, the quarries, and the soil of India may be done justice to, which assuredly, has never yet been the case.\* In this all classes are so clearly interested, that it would be superfluous to shew it, as it is to shew that the resources of every country are far more readily developed with public means for investigating, preserving, and publishing all knowledge belonging to them, than where none such exist.

It is therefore hoped, that those who may be desirous of assisting this great public work, will bear in mind, that nothing, however familiar it may be to those on the spot, is indifferent to us; for *if not wanted for the institution, it may serve to procure that which is*; and the following note is given rather as a general memorandum than as specifying all which is desired. The general rule is, that details cannot be too numerous, nor specimens too various, particularly if purely Indian.

\* It is curious to find that upwards of 140 years ago, the ores of the precious metals were an article of export from the Dutch East Indies! This is clearly shewn by the following passage from Schlutter's work, as translated by Hellot, and published by him under the title of "*Hellot sur les Mines*," Paris, 1753. In Vol. II. p. 285, Chap. XLVI. "*On East Indian Ores and their Fusion by the curved Furnace*," he says—

"In 1704, Schlutter received by a private channel twenty-five quintals of ore from the East Indies, &c." And again: "These sorts of ores (of gold and silver) sent from India by the Dutch were frequently smelted at the foundery of Altenau in the Upper Hartz, but had never been smelted in the Lower Hartz. This ore was in lumps from the size of a nut to that of walnut, and by trials it was found that the quintal of 110lbs. contained 1 oz. 8 drs of gold and 3½ oz. of silver."

## DESIDERATA FOR THE MUSEUM OF ECONOMIC GEOLOGY OF INDIA.

### I.

#### MINES AND MINING PRODUCTS.

1. Specimens of all crude ores, just as found. If possible also, of the rocks or matrix in which found; of those indicating the vein at the surface; of the walls of the veins; of the strata or beds passed through before reaching them; and of the rocks of the surrounding country.

2. The ores after preparation for the furnace by picking, washing, stamping, roasting, &c.

3. The rejected ores, gravel or stones found with those used; which often go under odd names, as those of "mother, devil," or the like.

4. The fluxes used, if any.

5. Memorandum of the kind of fuel used, samples of it if coal or coke, &c.; names of the trees, as bamboo, &c. if charcoal; and if not too far, send specimens.

6. The roasted or half smelted ore.

7. The pure metals, as obtained in a merchantable state, of all the qualities.

8. The slags, of all kinds, from the furnaces and smeltings.

9. Drawings or models (to scale of possible) of all furnaces, machinery, and implements used in any of the processes, with drawings, plans, and models of the mine. Earthen models of the furnaces, &c. may often be well made, by the native image makers for a mere trifle.

10. Specimens of any tools used.

11. Traditions, history, and statistics of the mine or mineral products, as (1.) How and when found; (2.) Produce, gross and net; (3.) Rent if farmed, or what tax payable on the product; (4.) Price of daily labour; (5.) Amount of labour obtainable for a given price; (6.) Estimated profits, past and present; (7.) Reasons for decay or increase; (8.) What is now required to make the mine more productive; (9.) Copies or notices of any books or accounts of the mine; (10.) Health, comfort, morals, and condition of the workmen employed, average of ages, and of life among them if thought unhealthy; seasons and hours of work. Superstitious notions, peculiar diseases, &c. &c.

### II.

#### BUILDINGS, CEMENTS, POTTERY, COLOURS, ROADS, &c.

1. Specimens from the quarries, of all kinds of building stones, useful or merely ornamental.

2. The same of limestones, shells, corals or other articles, used to make lime or cements of all kinds.

3. Specimens of the strata above and below the quarried stone.

4. Any fossil shells, bones, fish, plants, insects, or other appearances of organic remains large or small, found in or near the quarries, or amongst the rubbish and water-courses of quarried spots. If specimens appear too large to move, please to give a notice, with an eye-sketch, and estimate of the expence of moving, and preserve it till a reply is sent.

5. Specimens of the building stones or remarkable bricks used in any public edifices, monuments or tombs, with the date of their erection if known, and a note to say if exposed to weather or protected by stucco, paint, or roofs.

6. Memoranda and specimens of any plants or animals destructive to masonry, as boring worms and shells in water, and the like, with specimens of their work.

7. Ornamental or stucco-work : specimens of it, new or old, interior or exterior, with the best account procurable of the materials, preparations, and working of them.

8. Specimens of stones and marbles, shells, &c. used for image or ornament-making ; of earths for pottery, and varnishes of coloured earths of all sorts, whether used as pigments or not.

9. Specimens of peculiarly good materials used for roads, whether ancient or modern, with prices, methods of using them, and other Memoranda.

10. Prices of all the above ; rates of labour, carriage, &c. from the rough to the wrought state, and all other statistical details as in the case of Mines and Mineral products above mentioned.

### III.

#### AGRICULTURAL GEOLOGY.

1. Specimens of soils of good, and the best qualities, for all kinds of produce, as sugar, cotton, tobacco, &c.

2. Of infertile soils or veins of earth.

3. Of the subsoil or rock.

4. Of the stones scattered about these soils.

5. Memoranda relative to the height of these soils above the water of wells in the rains and dry season, and of its drainage, shelter, exposition, &c.

6. Of any kind of earths, mud, or stones used as manures, as peats from the jheels, kankura, &c.

7. Of the deposits (fertile and infertile) left either by the common inundations or by violent floods, with memoranda of their effects on the cultivated soil.

8. Specimens from any separate spots, where gravel or stones are collected in quantities after inundations or floods.

9. Accounts of remarkable floods, and average heights of the rise of rivers, of the raising of the soil, alterations in its produce consequent thereupon, and all other details.

10. Memoranda relative to the formation or destruction of river-banks, islands, &c. with measurement if obtainable.

11. Samples of all kinds of efflorescent salt-earths, with specimens of the different salts prepared from them, prices of preparation, selling rates, and accounts of the processes and uses of the salts.

12. Specimens of brine springs, with details of manufacture if boiled for salt, and statistics of labour and produce, &c. as in the case of mines.

### IV.

#### MEDICAL GEOLOGY.

1. Specimens of mineral medicines of all sorts, whether produced on the spot or imported, crude and prepared, with notes and samples of the process of preparation in all its stages.

2. Of the water of mineral springs, their temperature, incrustations about them, account of their uses, and specimens of the rocks or soil in which found.

## V.

## NATIVE METALLURGICAL PROCESSES, OR MINERAL MANUFACTURES.

1. Exact descriptions of them, however rude or simple they may appear, with samples of the ores, fuel, fluxes, products, slags, &c.
2. Models or drawings (to scale if possible) of the furnaces and implements of all kinds ; specimens of these last may be sent.
3. Memoranda and samples of the earths or sands used for moulds in castings, of the crucibles and beds, raw and baked, and of the raw material from which made.
4. Prices of raw and wrought materials.
5. Drawings of machinery used for turning, boring, polishing, &c.

In conclusion : It is not supposed that any individual, unless wholly devoted to the research, can supply the whole of the desired specimens, or even of the knowledge relative to any one product; but any *single* item of the foregoing may be of importance, at sometime, to some one ; and it will be the special duty of the Asiatic Society, and of the Curator of the Museum, to see justice done to every contribution ; whether relating to the Geology of India in general, or to this peculiar branch of it.

H. PIDDINGTON,

*Curator, Museum Economic Geology.*

*Correspondence respecting the Society's Museum of Economic Geology.*

NOTE.—The institution of our Museum of Economic Geology is necessarily of such interest, that the publication of the Correspondence having reference to it, and to the appointment of a joint Curator, will be read with satisfaction by many of my readers.



*To H. TORRENS, Esq. Secretary to the Asiatic Society.*

SIR,—In continuation of my letter, No. 433, dated the 24th March last, on the subject of the formation of a Museum of Economic Geology in India, I am directed by the Right Honorable the Governor to transmit, for the information of the Asiatic Society, Extract Paragraphs 2d and 3d of a despatch from the Honorable the Court of Directors, No. 13 of 1841, dated the 8th September, and to invite the Society's particular notice to the requisition therein contained, with a view to its being complied with whenever practicable.

2.—I have been further desired, in connection with the 2nd paragraph of my letter dated the 14th April last, to enclose for the Society's information, copy of a circular addressed by the Military Board to the



Superintending Engineers, forwarding a copy of Captain Tremenheere's Memoir, agreeably to Mr. Piddington's suggestion.

I have, &c. &c.

G. A. BUSHBY,

*Secretary to the Government of Bengal.*

FORT WILLIAM, the 1st December, 1841.

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*Extract from letter No. 13 of 1841, from the Honorable the Court of Directors, in the Revenue Department, under date the 8th September.*

2.—We have transmitted a copy of Mr. Piddington's Report to Mr. Delabeche, the Director of the Museum of Economic Geology in this country, and we have informed that gentleman, that we shall be happy to receive from him for transmission to you, any communication which he may desire to make on the subject of that Report, as well as any further specimens which it may be in his power to add to the collection.

3.—We desire that you will transmit to us any specimens which you may be enabled to collect of objects, which in your opinion may be appropriately presented to the Institution over which Mr. Delabeche presides.

(A true Extract,)

G. A. BUSHBY,

*Secretary to the Government of Bengal.*

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CIRCULAR No. 31.

*To the Superintending Engineers.*

I am instructed by the Military Board to send for circulation to the Officers of Public Works under your control, the copy of Mr. Secretary Bushby's letter No. 432 of 24th March last, and copies of a Memorandum drawn up by Captain Tremenheere, regarding the establishment in Calcutta of a Museum of Economic Geology, and to request that you will invite the co-operation of the Executive Officers of your circle in the attainment of the proposed end.

2.—The Memoir contains full instructions as to the manner in which the co-operation of officers may be best effected. It shews what speci-

mens should be collected, and what information should accompany them.

3.—The Board desire me to express their hope, that officers will turn their attention to the objects contemplated in the formation of the proposed Museum, and they desire me to request, that when any box of specimens is collected the circumstance may be reported to you, and your orders taken as to its transmission before any actual expense is incurred. A copy of the descriptive papers which are to accompany the box should also be sent to you, in order, that if the information appears deficient in any essential point, you may have the deficiency supplied before the specimens are actually sent to Calcutta.

4.—The Board would wish you to exercise your discretion as to having the boxes sent in the first instance to your own office and thence transmitted to Calcutta, or in desiring Executive Officers to send the specimens direct to the Presidency ; but in either case, they should be sent to the Board's office for transmission to Government.

5.—The Board request particular attention to the 2d paragraph of Mr. Bushby's letter, but they do not conceive it to be the intention of Government, that useful specimens should be entirely withheld, when opportunities of sending them free of expense do not occur. The Board trust, however, that the most economical mode of transmission will always be adopted.

I have, &c.,

(Signed) A. BROOME,

*Officiating Secretary Military Board.*

*Military Board Office, 6th November, 1841.*

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*To G. A. BUSHBY, Esq., Secretary to Government, General Department.*

SIR,—Your letter dated the 1st ultimo, with its enclosures, was laid before the Meeting of the Asiatic Society held in this month, and the Meeting referred the subject to the Committee of Papers, in order that full consideration might be given to the important subject urged by the Honorable Court of Directors upon the attention of the Society, in connexion with the formation of a Museum of Economic Geology for India, and the collection and arrangement of specimens here, of which duplicates should be transmitted for preservation in appropriate Museums in England.

2.—The Governor of Bengal is aware, that a suitable room of our premises has been assigned for the specimens brought to India by Captain Tremenheere, and that the Society has a large assortment of Mineralogical and other specimens, collected from various parts of India, from which, with care in the arrangement, and particular attention to the localities from which the articles have been procured, a valuable Museum of the kind desired, might now be commenced upon, so as to form nucleus of an Economic institution, to which all public officers might refer for information, and into which all further objects of useful discovery might, as collected by the Officers of Government, be brought for safe deposit and investigation.

3.—But for the arrangement of the specimens we possess in the scientific order requisite, and for their discrimination and proper ascertainment, the entire services of a gentleman versed in somewhat more than the rudiments of sciences of Geology and Mineralogy, and a proficient in Chemistry, and the use of tests for purposes of analysis, will obviously be indispensable; and it would be a great advantage that this gentleman should also not be a stranger to the Geography and languages of the country, and that he should be known to, and in habits of correspondence with, persons engaged in similar pursuits in different parts of India.

4.—The Curator the Society has recently obtained from Europe, Mr. Blyth, is eminent in all departments of Zoology, and his indefatigable exertions in this line, have already increased largely the value of the Museum, as well by the addition of an infinity of new specimens excellently set up, as by the discovery amongst our neglected stores of objects valuable to science which had escaped the less accurate investigation of his predecessors in this line. But Mr. Blyth's whole time is occupied in this very extensive branch of the Museum, and he does not profess at present, to be sufficiently acquainted with Mineralogy and Geology, to be able to superintend the formation of the desired Economic Museum; besides that being new to the country, and unacquainted with its localities and languages, he would feel greatly at a loss in the attempt to arrange and investigate the affinities of soil, and other characteristic peculiarities of provinces and districts, which it should be the aim of an Economic Museum to display.

5.—The Society has been indebted to Mr. Piddington for all that has yet been done in this department; the qualifications of this gentle-

man as a chemist and man of general science, are well known to the Governor of Bengal, but his attainments in the branches of Geology and Mineralogy, and the attention he has given to these sciences in their special application to India, may not have been antecedently represented to his Lordship. He is regarded by the members of the Committee, and by the Society for which they are acting, as eminently qualified to undertake the particular duties and charge to which their attention has been thus directed.

6.—Circumstances at the present juncture enable this gentleman to give to the Society a large portion of his valuable time, but render it impossible, that they should be accepted without remuneration. On the part of the President and Committee of Papers of the Society therefore, I am directed to request you will submit to his Lordship, that if importance be attached to prosecuting researches in Economic Geology, and to the careful examination and arrangement of specimens and objects connected with this science, they see no means of satisfying the wishes of the Government and of the Court of Directors, except by securing the services of Mr. Piddington, on a separate salary equal to that now assigned to the Curator; viz. 250 Rupees per mensem. We cannot hope that Mr. Piddington will engage permanently, or for any given period on these terms, but we doubt not that his exertions for the time of his devoting himself to this branch of our Museum, will place the department on such a footing, as will much facilitate its being afterwards carried on by less competent persons; and in this manner, a basis will be laid for a Museum of infinite value to science and to the public service.

7.—Mr. Piddington's services, if engaged, will be of infinite use to the Society in other branches also, for he is versed in Numismatology, and proficient in all the knowledge required for the discrimination and arrangement of scientific objects. The Committee would propose for him the title, "Joint Curator," giving to his special charge, as well the Geological as any other parts of the Museum, that we might consider him specially qualified to arrange and report upon.

I have &c. for the Committee,

(Signed) H. TORRENS,

*Secretary to the Asiatic Society.*

*Asiatic Society's Rooms, Calcutta, the 27th Jan. 1842.*

No. 265.

*To H. TORRENS, Esq. Secretary to the Asiatic Society.*

General Dept.

SIR,—I am directed to acknowledge the receipt of your letter, dated the 27th ultimo, conveying the recommendation of the President and Committee of Papers of the Asiatic Society for the appointment of Mr. Piddington as Joint Curator to the Museum of Economic Geology, with reference to the orders for the formation of a Museum of Economic Geology for India.

2.—In reply I am desired to state, that the Right Honorable the Governor of Bengal, with the concurrence of the Government of India, has been pleased to sanction a payment from the Treasury of 250 Rupees a month for the remuneration of Mr. H. Piddington in the appointment of "Joint Curator" to the Museum of Economic Geology, which the President and Committee propose to confer on that gentleman. The accompanying Extract, Paragraph 5, from a letter dated the 23d June 1841, in the Revenue Department, from the Honorable the Court of Directors, will inform the Society as to the views of the Honorable the Court of Directors respecting the appointment which has been thus constituted, and the duties that he is expected to perform in connection with the Museum of Economic Geology.

3.—I am directed to take this opportunity of transmitting for the information of the Asiatic Society, a copy of a despatch from the Court of Directors, No. 14 of 1841, dated the 2d of November, and of the Letter and Memorandum from Mr. Delabeche therein mentioned.

I am, &amp;c. &amp;c.

G. A. BUSHBY,

*Secretary to the Government of Bengal.**PORT WILLIAM, the 26th February, 1842.*

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*Extract from letter, No. 10 of 1841, from the Honorable the Court of Directors, in the Revenue Department, dated the 23d June.*

5.—We cannot doubt that much benefit may be derived from such an institution under proper superintendence. In order, however, to make it practically useful, we apprehend that it will be necessary to place it

under the charge of an individual sufficiently versed in Chemistry to be competent to make the necessary analysis of ores, soils, &c. and to suggest the means of turning those analyses to account. To this individual might also be assigned the care of the Mineralogical records deposited in the Museum, which will probably in no long time become so voluminous as to be altogether useless, unless properly classified and arranged. In our despatch of the 27th May, (No. 5,) 1840, we anticipated the necessity of the appointment of such an officer, and we shall not object to your assigning a moderate salary to any individual who may be found competent for the discharge of the duties of such a situation.

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No. 14 of 1841.

*Our Governor of the Presidency of Fort William in Bengal.*

In continuation of our dispatch in this Department, (Museum of Economic Geology,) dated the 8th September last, (No. 13,) we transmit for your information copy of a letter (dated 9th Sept. 1841,) which we have received from Mr. Delabeche, and of the Memorandum which accompanied it, on the subject of the establishment of a Museum of Economic Geology in India.

We are,

Your loving Friends,

(Signed) GEORGE LYALL,  
 „ J. L. LUSHINGTON,  
 „ H. LINDSAY,  
 „ JOHN LOCH,  
 „ H. SHANK,  
 „ J. PETTY MUSPRATT,  
 „ C. MILLS,  
 „ J. W. HOGG,  
 „ F. WARDEN,  
 „ JOHN COTTON,  
 „ ARCHDEACON ROBERTSON,  
 „ HENRY ALEXANDER,  
 „ HENRY WILLOCK.

*London, the 2d Nov. 1841.*

*Ordnance Geological Survey, Haverfordwest,  
South Wales, 9th Sept., 1841.*

JAMES MELVILL, Esq. &c. &c. &c.

SIR,—I have the honor to acknowledge the receipt of your communication of the 2d instant, accompanied by the report to which it refers of Mr. Piddington, on a collection of specimens taken to India by Captain Tremenheere, as a basis for a collection for a Museum of Economic Geology in India.

As the Court of Directors of the East India Company were pleased to say that they would be happy to receive any communication on the subject which I might make, I have ventured to send the accompanying memorandum, and have therein given a brief account of the Museum of Economic Geology, established under Her Majesty's Government, for the information of the Directors.

Permit me through you to return the Directors my sincere thanks for their kind offer of sending specimens from India to our Museum. Every thing which relates to the Metallurgical processes of India would be highly valuable: specimens of steel, such as is used for arms, would be particularly so. Ores of the useful metals, and any information relating to their mode of occurrence would be very acceptable. Models, or drawings from which models could be constructed, of any of the native mining machinery, methods of reducing the metals, or tools used in mining, would be valuable, however simple these contrivances may be.

Perhaps you will do me the favour to assure the Directors, that if they may consider any service I can render in the formation of the proposed Museum at all desirable at any time, I shall esteem myself fortunate in being able to afford it.

(Signed) H. F. DELABECHE,  
*Director, Ordnance Geological Survey.*

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*Memorandum respecting a Proposed Museum of Economic Geology in  
India.*

Not being aware of how far the Directors of the East India Company may be desirous of forming in India a Museum of Economic Geology, similar to that established under Her Majesty's Government in this country, modifying it only to suit the difference of conditions existing in the respective countries, or may be informed of the exact character

and design of the Museum of Economic Geology in London, perhaps it may be useful, and not altogether out of place, briefly to state the objects for which the latter were founded, and to shew the manner in which we endeavour to attain them, before I venture to offer any observations which Mr. Piddington's Report may have suggested on the proposed establishment in India.

The Museum of Economic Geology was founded, in order to obtain a more perfect and general knowledge of the mineral wealth of the United Kingdom and its colonies than now exists,\* and to render the knowledge thus obtained readily available to the public, endeavouring to promote an increase in the advantages to be derived from our mineral wealth, by shewing where and in what manner mineral substances at present untouched in particular districts may be profitably worked; by pointing out that by adopting the mode of working elsewhere either in this or other countries, mineral substances may be more profitably raised than they now are in certain districts, and by preventing an useless expenditure of time and capital in researches which can only end in disappointment.

Another chief object is to shew the application of Geology to Agriculture, and to afford to the public the facility of obtaining correct analysis of soils at a rate so moderate, as to bring them within the means of the many, and thus, by obtaining a multitude of facts relating to soils, be enabled to arrive at conclusions which may be of very material benefit to the agriculture of the country, and which might not otherwise have been rendered so readily apparent.

In fact, the Museum may be considered, without further detail, as an establishment founded to shew and promote the application of Geology to the useful purposes of life in a variety of important ways, and thus aid in advancing the general welfare of the country.

Though the establishment is termed a Museum, from containing collections of mineral and metallurgical specimens, models, &c., these collections only constitute a part of the general whole, and are solely intended to render that whole effective. Under the same roof, there is a well appointed Laboratory, an office for the accumulation and preservation of the mining documents of the United Kingdom, and a work-shop

\* Itself an object of great national importance, as even at present it is known that the annual value of the Coals (taken at the pit mouth, and of the metals, and of a few other mineral products) in their first merchantable conditions raised in the United Kingdom, exceeds £20,000,000.



for the construction of models from working drawings, both British and foreign. Mr. Richard Phillips, F. R. S., long distinguished as an analytical chemist of the first order, has charge of the Laboratory and of the mineral and metallurgical collections, and Mr. Jordan, a gentleman of considerable ability, and previously Secretary of the Polytechnic Society of Cornwall, superintends the Mining Record Office and the Model Department. Both gentlemen receive pupils under certain regulations, the former in analytical chemistry, metallurgy and mineralogy; the latter for mining, section and plan drawing, and mining machinery; it being considered a great object to teach as much as possible by aid of the establishment, its collections of mineral and metallurgical specimens, models, &c. being freely employed for the purpose, and not intended for mere shew, though eventually the public will be admitted to view them gratuitously in the same manner as the collections of the British Museum are exhibited.

The establishment may be considered as formed to a certain extent of distinct parts, though they are necessarily much blended with each other, and may be said to consist of the Mineral and Metallurgical Collection, the Laboratory, the Model Department, and the Mining Record Office.

The Mineral and Metallurgical Collections are divided into,

a.—The various ores of the useful metals at present raised in the United Kingdom and its Colonies.

b.—Specimens to illustrate the mode in which these ores occur, and the general conditions under which they are found.

c.—A metallurgical series, shewing the mode of reducing the ores to the metallic state, as practised in the United Kingdom or Colonies.

d.—The foreign ores of the useful metals, in order to accustom the eye of the British miner to all known appearances of the ores of the useful metals.

e.—Specimens illustrative of the mode of occurrence of these foreign ores, so that the British miner may see wherein this may differ from, or agree with, the manner in which ores are found in the United Kingdom.

f.—A series illustrating the manner in which the ores are reduced to the metallic state in foreign countries.\*

\* The British specimens of ores and metallurgical processes are kept distinct from the foreign, to shew at one glance what is really known or done in the United Kingdom, and therefore what more or less is known, as relates to the same subjects in other countries.

*g.*—A series illustrating the manufacture of steel, brass, and other metallic compounds or alloys.

*h.*—An extensive series, illustrating the rocks which either have been or may be advantageously employed for Architectural or Engineering purposes.

*i.*—The various cements, bricks, tiles, or other artificial mineral compounds which may be, or have been, employed for the same purposes.

*k.*—A series of the substances used in the manufacture, and illustrating the manufacture itself of British porcelain, earthen-ware, and the coarser potteries.

*l.*—A series of soils, with their analysis attached, and a notice of such circumstances connected with the climate and the situation of the localities where they occur as can be obtained, accompanied by such specimens of the subsoils or rocks in which they rest as can be procured.

In the *Laboratory*, analyses of mineral substances, such as ores, rocks, soils, &c. are made at a regulated price for the public, who not only thus obtain correct information without fear of fraud from interested motives, but also do so at moderate cost. Analyses are also executed for such Government Departments as may desire them ; and pupils, as above mentioned, are received.

The *Model Department* will consist (and numerous important models are already in the collection) of models to illustrate mining operations, from the most simple conditions up to the most complicated of mining machinery, and of such operations connected with mines as can be well shewn by models, not only British but foreign, and of furnaces and other works for the reduction of the metals. The tools and instruments used in mining in different countries, with specimens of the ropes, chains, &c. employed, form also part of this collection.

In the Mining Record Office, not only will the plans and sections which relate to British mining be accumulated, but all documents relating to foreign mines which can be obtained, will be added to the collection, and it is expected, from the arrangements which have been made, that much important information will thus be brought together. Geological maps and sections of various countries will be here assembled, and it is intended eventually to form a *Library*, containing works in

various languages, which may relate to the application of Geology to the useful purposes of life.

It might, at first sight be supposed, however desirable such an establishment as this, which has been thus briefly noticed, may be in India or elsewhere, that it would require considerable expenditure and much trouble to form. From experience I can say, that I believe the contrary would be the case, provided it were placed directly under a Government, which necessarily in almost all countries, possesses the means of carrying out the objects of an institution of this kind in a manner which cannot be within the reach of any body of men formed into a society, however active the members of that body may be.

The collections in the Museum of Economic Geology though no doubt valuable, have cost the country a mere trifle, having been chiefly presented by persons anxious to promote the success of the institution, because it was national, and belonged to the public, under the controul and care of Government. At the same time it must be admitted, that a large portion of the collections have been formed through the exertions of the Ordnance Geological Survey, during its progress through the country, causing the Museum to be more known and appreciated than it might otherwise so soon have been, and thus inducing many influential persons to make extensive presents to it.

It would appear from experience, that in such establishments outlays of money are at first less requisite than arrangements by which the various means of information at the disposal of a Government can be rendered available, and at a suitable place set apart for the reception of the different specimens, models, and other objects of interest that can be collected, waiting, as was done at the Museum of Economic Geology in London, until the accumulation of information and of specimens, models, or other objects of interest should be sufficiently great to carry out the design of the establishment on a more extended scale; it being at the same time observed, that a laboratory and a good analytic chemist appointed to it, may be considered as among the earliest requisites.

The collections taken out to India by Captain Tremenhare, were necessarily incomplete, and were merely intended as a foundation for a more extended series of specimens, illustrative of the applications of Geology to the useful purposes of life; but like all such first collections, they are most valuable as constituting such a foundation, and in this in-

stance, they have been the means of calling forth a very able report from Mr. Piddington, as to his views respecting the requisites for collections of this kind in India. Though Mr. Piddington's catalogue of *desiderata* may appear large, and refer perhaps, more to a complete series of collections, than to what may be sufficient and essentially required for the well-working of a Museum of Economic Geology in India, yet a large part of them could be supplied at a very moderate cost. Time and opportunity will be required far more than money for a very large part of the desired collections, though no doubt, some small outlays may from time to time be necessary. It would be our earnest desire, as well as our duty, at the Museum of Economic Geology, to aid an institution of the like kind established under the East India Company in India, and it would be very easy to endeavour, as much as possible, to obtain duplicates of Foreign as well as British specimens, likely to be useful in India, when we collect them for ourselves. Copies of the plans and sections of the Metalliferous and Coal mines in our Mining Record Office could readily be furnished at the expense of the copying, and care could be taken to select only such as would be likely to be useful in India. Arrangements might be made to find competent persons to construct copies of such of our models as might be thought valuable, particularly those required in the earliest conditions of a mine. In fact, much could be accomplished, at once and readily, in this manner, should it meet the approbation of the Directors of the East India Company; and as regards the applications of Geology under consideration, we might be rendered available for what is done in the United Kingdom and in many parts of Europe; at the same time it would be desirable that applications to the friends of India, resident in this part of the world, should not be neglected.

The most important part of the collections must necessarily be made in India, and can probably be best accomplished in the manner pointed out by Capt. Tremenheere and Mr. Piddington.

I would venture to suggest, that it would be very desirable by any methods that may be deemed most expedient, as early as possible to procure an estimate, however rough it may be, of the mineral resources of India, *i. e.* that those points which may appear the most promising, may receive the required attention, and the real state of knowledge on this subject be shewn by something like effective and trust-worthy docu-

ments. By the same means, the collections might gradually become considerable, comparisons be instituted where comparisons were likely to be useful, both as regards the parts of India with each other, and with foreign countries. Analysis of soils, which should be made as well with regard to their physical as chemical conditions, due attention being paid to climate, would accumulate, and eventually a mass of information would be collected, which could not fail very materially to assist in improving the agriculture, and developing the mineral wealth of the vast territory under the Government of the East India Company.

(Signed) H. F. DELABECHE,

*Director of the Museum of Economic Geology.*

*9th September, 1841.*

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TO H. TORRENS, Esq., *Secretary Asiatic Society.*

SIR,—With reference to our conversation on the subject of a Laboratory for the Museum of Economic Geology, I set down here as requested, such Memoranda as occur to me for the information of the Committee of Papers and the Society.

1.—“A laboratory and a good analytical chemist appointed to it may be considered as amongst the earliest requisites for a Museum of Economic Geology,” says Mr. Delabèche, in replying to the Court of Directors on their referring to him my report of February 1841, and he is writing in England. We may add here, I think, “in India far more than in England?”

2.—The arrangements for a laboratory require a room, and I cannot see how to obtain one of improper size, without adding to our present accommodation.

3.—The arrangement proposed by you, would give us additional room for many things which now become much crowded: and for models, records, &c. which will gradually accumulate in the Museum of Economic Geology, in which, be it remembered, we have to collect *both* Indian and European knowledge and specimens.

4.—We require room for coarse furnace work, and for our more delicate analytical operations, which cannot (be it remembered) be carried on in open rooms, or left to chance-meddling, or exposed to theft if of value. Room for the Superintendent, where he can work undisturbed

by visitors, is also highly desirable under existing arrangements, and at the very best time for work, a morning is often lost by the indispensable civilities to chance visitors. Where laboratory work is going on, this is out of the question.

5.—It may appear, that I am asking for means and appliances more extensive than our present Museum of Economic Geology requires; but to this it may be replied, that there is no lack of laboratory work even now, and when we make known our views and desires, there will be plenty more: add to which, that the first reference to us from Government *may* be our requiring all the resources of a good laboratory to reply to it creditably. I may be excused, if I remark in conclusion, that it belongs to the Society, with such an opening as is now afforded to it, to shew its readiness to do honour to the patronage it meets here and at home.

H. PIDDINGTON.

16th March, 1842.

NOTE.—The means and appliances to which Mr. Piddington alludes, as necessary for the efficient establishment of the Museum, have been afforded by the Society in the same spirit of liberality and zeal for the cause of science, which actuated the Honorable the Court of Directors and the Government of India, in contributing so eminently to the formation of the institution. The Honorable the President of the Asiatic Society, (H. T. Prinsep, Esq.) at once proposed to make such additions to the spacious building which contains our Library and Museum, as might not only supply a proper Laboratory, but also give additional room for the Geological and Mineralogical department, as well as allow of the appropriation of a new and handsome apartment to be added to the upper story of the house to a better disposition of our Books, or to our Ornithological Collection, which daily undergoes augmentation. These works are in a forward state, the President's proposition having been warmly adopted.



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Day.	Morning Tide A. M.						Wind.	Evening Tide, P. M.						Weather, &c.
	Low Water.			High Water.				Low Water.			High Water.			
	Time.	Height.	Time.	Time.	Height.	Range of Tide.		Time.	Height.	Time.	Time.	Height.	Range of Tide.	
1 Friday,	9 16	5 6	3 18	9 4	3 10	N. ....	9 47	5 3	3 39	10 3	5 0	N. ....	7 15 A. M. light rain, noon overcast, 4. 35, P. M. a light shower.	
2 "	9 58	5 9	3 56	9 1	3 4	N. ....	10 47	6 1	4 6	9 2	3 1	N. ....	day alternately clear and cloudy.	
3 Sunday,	11 19	4 11	5 18	8 9	3 10	N. ....	11 53	5 10	5 28	8 6	2 8	E. ....	clear all day.	
4 "	0 0	0 0	6 17	9 4	0 0	N. ....	0 54	4 8	7 26	9 11	5 3	N. E. ....	ditto ditto.	
5 "	1 22	5 7	7 38	10 7	5 0	N. ....	1 43	3 9	8 19	10 1	6 4	N. E. ....	ditto ditto.	
6 "	1 57	4 9	8 37	11 2	6 5	N. W. ....	2 27	2 9	8 54	10 6	7 9	N. ....	6 7 A. M. squall from N. W. with rain, noon cloudy, 5 50 P. M. rain.	
7 O	2 58	4 7	9 4	11 6	6 11	N. W. ....	3 15	2 7	9 50	11 4	8 9	N. ....	Clear all day.	
8 "	3 52	4 5	10 18	12 1	7 8	N. ....	4 17	2 1	10 58	11 3	9 2	N. ....	6 A. M. clear, 11 45 A. M. cloudy with light showers occasionally, 11 15 P. M. rain.	
9 "	4 7	3 9	11 15	12 8	8 11	N. W. ....	5 12	2 3	11 27	11 5	9 2	N. ....	4 50 A. M. rain, noon cloudy, 5 18 P. M. rain	
10 Sunday,	6 2	3 9	0 0	0 0	0 0	N. ....	6 27	3 7	0 17	12 11	9 4	N. ....	day cloudy, 4 25 P. M. light rain.	
11 "	6 43	4 5	12 43	11 7	7 2	N. E. ....	7 12	4 7	12 52	12 3	7 8	S. E. ....	day alternately clear and cloudy, 3 43 P. M. showers.	
12 "	7 13	4 9	1 19	11 3	6 6	N. ....	7 48	4 9	1 7	11 8	6 11	W. ....	day cloudy, 11 47 A. M. rain, 52 P. M. squall from westward with heavy showers.	
13 "	8 6	5 3	2 9	10 11	5 8	N. ....	8 12	4 10	2 13	10 11	6 1	N. W. ....	ditto ditto.	
14 (	8 18	5 7	2 19	10 4	4 9	N. ....	8 53	5 6	2 27	8 6	3 0	S. E. ....	day alternately clear and cloudy, 5 4 P. M. very light drizzling rain.	
15 "	9 3	6 1	3 9	8 7	2 6	N. ....	9 29	5 7	3 12	8 9	3 2	Westy,	Forenoon clear, 1 15 P. M. showers 1 37 thunder.	
16 "	9 47	6 3	3 42	8 10	2 7	N. ....	10 49	5 7	4 11	8 7	3 0	N. E. ....	day alternately clear and cloudy	

*Register of the Rise and Fall of the Tide at Prince of Wales Island and Singapore, furnished to the Editor by order of the Government of India,—January 1841.—(Continued.)*

Day.	Morning Tide A. M.						Evening Tide P. M.						Wind.	Weather, &c.	
	Low Water.			High Water.			Low Water.			High Water.					Range of Tide.
	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.							
17 Sunday,	10 57	5 2	5 28	9 3	4 1	N. ....	11 49	5 4	5 38	9 1	N. E. ...	Clear all day.	11 30 A. M. rain clear.		
18 "	0 0	0 0	6 25	9 4	0 0	N. E. ...	0 57	3 9	7 42	9 3	N. E. ...	Forenoon in larg	A. M. light rain,		
19 "	1 18	5 1	7 32	9 5	4 4	N. ....	1 49	3 8	8 13	9 4	N. E. ...	1 P. M. t	clear and clou-		
20 "	2 12	5 3	8 27	9 7	4 4	N. ....	2 47	3 7	9 15	9 6	E. ....	dy.			
21 "	3 16	5 2	9 23	10 6	5 4	N. E. ...	3 43	3 1	9 52	10 3	N. ....	ditto ditto, 2 47 P. M. drizzling			
22 ●	4 2	4 11	10 5	11 3	6 4	N. E. ...	4 54	2 11	11 7	10 7	N. ....	rain.			
23 "	5 14	4 9	11 9	11 6	6 9	Easterly.	5 49	2 8	11 56	10 9	N. ....	ditto ditto, 11 20 A. M. heavy showers with thunder.			
24 Sunday,	6 4	5 7	0 0	0 0	0 0	N. E. ...	6 15	2 3	0 8	11 9	N. E. ...	ditto ditto.			
25 "	6 42	5 10	0 32	10 11	5 1	N. ....	6 53	2 1	0 57	11 6	N. ....	ditto ditto.			
26 "	7 9	6 2	1 4	10 10	4 8	N. ....	7 12	2 4	1 9	11 8	Sty.	ditto ditto. 48 P. M. passing show.			
27 "	7 17	6 4	1 17	10 11	4 7	N. ....	7 42	2 9	1 20	11 9	Sty.				
28 "	7 54	6 3	1 56	10 9	4 6	N. W. ...	8 4	3 2	2 0	11 2	N. 1				
29 "	8 9	5 8	2 12	10 3	4 7	N. ....	8 11	3 8	2 18	10 6	N. 1				



(Sd.) E. M. ELLIOT, 2d B. Engrs.  
Supt. Magt. Singapore.

30	4 00	2 08	7 11.5	3 11.5	N. N. W. & V.	0 15	Serene, ....	h—# hZ	Overcast, ..	Serene, ....
8 16	4 10	3 03	7 02.5	2 04.5	N. N. E. & N. W. by N.	0 91	Serene, ....	..	..	..
8 35	5 05	4 00	6 02.4	00 09.4	N. N. E. & N. N. W.	0 18	Serene, ....	h#	Overcast, ..	Z clear #—
9 46	6 00	8 14	6 00.5	00 00.5	North, ....	1 11	Serene, ....	h#	Overcast, ..	Z clear,
57 A.M. 0 1 09	3 04.5	9 00.5	6 08.2	3 03.7	V. & W. by S.	0 14	..	h—# hZ	h	..
1 57	2 08.7	9 24	7 00	4 03.3	V. & N. W. by W.	0 01	..	h—#	Overcast, ..	Overcast, ..
2 39.5	2 05.8	9 42	7 07.8	5 02	V. & N.	0 08	..	hZ	Overcast, ..	Serene, ....
3 20	2 00.6	10 02	8 00.7	6 00.1	V. & S. S. E. ....	0 06	..	h—#	h—	Overcast, ..
3 47	2 01	10 10.5	8 04	6 03	V. & N. by W.	..	..	..	..	..
4 08	1 10.8	10 26	8 08.1	6 09.3	V. & N. E. by N.	0 025	..	h—# hZ	hZ	Serene, ....
4 57	1 11.5	10 55.5	8 11.2	6 11.7	N. E. by N. & N.	0 425	Serene, ....	h—# hZ	Nimbus,	..
5 16	20 15	11 13	9 03	7 01.5	S. & N. N. W. ....	0 225	..	h#	h#	—# Z clear,
5 50	2 07.4	11 37	9 06.5	6 11.1	S. E. by E. & N. E. N.	..	Z Clear, ....	Overcast,	h# hZ	..
6 10	3 01.5	{ 11 55.5 00 25.5 }	{ 9 07.2 9 06.8 }	{ 6 05.7 6 05.3 }	N. W. ....	..	Z Clear, ....	h—#	h#	h# hZ
6 33	3 08.6	1 18	9 00	5 03.4	W. N. W. & V.	0 24	Serene, ....	h—#	Zenith clear,	h & h—
7 09	4 07.8	2 10.5	8 09.5	4 01.7	N. by E. & V. ....	..	..	..	..	..
8 11	5 02.5	3 21.5	7 11	2 08.5	N. E. & E. by S.	..	Overcast,	h	h# hZ	Serene, ....
9 24	5 09.5	4 40	7 03.2	1 05.7	N. by W. & N. by W.	..	Serene,	h# hZ	— & h#	Serene, ....
1 21	5 10	6 51	7 01	1 03	S. by W. and S.	..	h and h..	h	h	h# Z clear,
					Total, ....	4,275	Inches,			

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*Narrative of a Journey from Soobathoo to Shipke, in Chinese Tartary.*

*By Lieut. A. GERARD, Bengal Native Infantry, in 1818.*

From Soobathoo, in latitude  $30^{\circ} 58'$  and longitude  $77^{\circ} 2'$ , situate about twenty miles from the plains, and 4,260 feet above the level of the sea, I marched to Mumleeg nine miles, three and a half miles from Soobathoo, crossed the Gumbur, an inconsiderable stream, but it had swollen so much from late rain, that its passage was effected with great difficulty. The road was a descent to the Gumbur, from which it slightly ascended.

*22d September.*—Marched to Simla thirteen and half miles. The road for the first eight and half miles was almost plain; then there was a steep ascent of one and half mile, and the last three were excellent, winding near the top of a range 7,000 feet high, and lying through a noble wood of many varieties of oak and pine.

*23d September.*—Marched to Bunee eleven miles. The road was level, leading amongst deep forests of pine, at the height of 8,000 and 9,000 feet above the sea. Thus far the path, which is practicable upon horseback, has been made by a company of Pioneers, for the facility of communication with the cantonment of Kotgoor, thirty-four miles further to the north-east.

*24th September.*—Marched to Pulana ten miles. Left the made-road six miles from last camp, and descended by an indifferent and slippery footpath to the village, which belongs to the Rana of Theog.

*25th September.*—Marched to the Kotkhaee eleven miles. The road lay along the bank of the Giree, one of the branches of the Jumna, and was often rocky and dangerous, the footpath being frequently overgrown with grass, and seldom half a foot in breadth.

Kotkhaee is the residence of the Kotgoor Rana, a hill chief under the protection of the British Government. It is situate on a most romantic spot, upon the point below which, two streams unite to form the Giree; on one side the rock is 182 feet perpendicular, and on the other there is a long flight of stone steps; neither of the streams, which are only twenty feet broad, are fordable, so by destroying the bridges, the place might be well defended against musketry. The Rana's residence is three stories high, and has a most imposing appearance; each story projects beyond the one beneath, and the top is crowned by a couple of handsome Chinese turrets, beautifully adorned with finely carved wooden work.

*26th September.*—Marched to Gujyndee eight miles. The road at first lay up the bed of one of the branches of the Giree, and there was a very steep and tiresome ascent of 2,400 feet to Deouree Pass, 8,885 feet high, from whence there was a descent to camp.

Gujyndee is in Nawur, a small district of Busahir, famed for its numerous iron mines; there are few spots here fit for cultivation, and the inhabitants, who are miners, live chiefly by their trade in iron. They work the mines only about three months in the year, and commence digging them in March, after the snow has sufficiently melted; at other times, they say, the earth falls in, and it is unsafe to work.

*27th September.*—Proceeded to Rooroo, a fatiguing march of thirteen miles, crossing a high range of mountains. Here we first came upon the Pabur, one of the feeders of the Tonse, which falls into the Jumna, and is a stream of considerable size. Barometrical observations give the extreme height of its bed 5,100 feet.

Rooroo is situate in Choara, one of the large divisions of Busahir, and the most populous and best cultivated spot I have seen in the hills; the dell is broad, and the ground is well adapted for rice fields, being watered by many canals cut from the river which winds through it.

Three marches more, or twenty-six miles, brought me to Jangleeg, the last and highest village in the valley of the Pabur, elevated 9,200 feet above the sea. The road latterly was extremely rugged and dan-

gerous, at one time many hundred feet above the river, with a horrid precipice on the right, at another dipping down to the stream which rushes with violence over the rocks interspersed in its channel; as you advance, the dell in which the Pabur flows becomes gradually more contracted, the mountains assume a more naked and abrupt appearance, and the rapidity and turbulence of the river increases. From Jangleeg proceeded ten miles to a halting place called Moondoor, within two miles of the Brooang Pass over the great snowy range. The road was good, and lay in a broad grassy glen, between two spurs of the Himalayas, with the Pabur running through it. The soil of this valley is composed of black vegetable mould, which produces endless varieties of Alpine plants to the height of 13,000 feet. Belts of birch and pine reach nearly the same elevation, beyond which, scarcely any thing is seen but patches of brown grass.

The height of my camp, which was pitched beneath an immense projecting granitic rock, was 12,807 feet. We left the last cluster of birch trees 3 miles behind us, so had to send back that distance for firewood. The thermometer was 38° at night, and water froze hard.

Next day, 2d October, we pitched our tent on the crest of the pass, 15,095 feet above the level of the sea; the road was of the worst description, crossing the Pabur, which has its source near this, by an arch of snow of some extent, and then leading over huge detached masses of granite, hurled from the peaks above, and piled upon one another in the utmost disorder, with here and there some snow. The ascent was steep the whole way, and almost the only vegetation we noticed was grass in small tufts, which grew more scanty as we advanced to the pass, where it almost disappeared; above it was still seen thinly scattered, and interspersed with a few mosses.

Here I met my brother, who had left Soobathoo some time before me and travelled by a much more circuitous route.

We sent most of our servants down about five miles to a more genial climate, where wood was procurable, and remained ourselves at the top. The peaks immediately on either side of us were not more than 1,000 feet above us, but there were several not very far distant, which we could not then see, 18,000 feet high. We were lucky in getting the altitudes and bearings of the principal mountains across the Sutlej, which rear their white heads to the height of 20,000 feet and upwards.

The thermometer in a tent got up so high as  $50^{\circ}$  during the day, but at 4 P. M. it fell to the freezing point, and at 7 P. M. was  $8^{\circ}$  below it. We sat up till past 10 for the purpose of making astronomical observations, which in such a temperature was rather an uncomfortable occupation ; our situation indeed in other respects was none of the most agreeable, we had but a scanty supply of firewood, which when kindled in the middle of the tent involved us in smoke, and we were somewhat incommoded by having to share our accommodation, such as it was, with our servants, whilst every now and then we were alarmed by the crash of rocks split asunder by the frost.

We had all severe headaches during the night, owing probably to the rarefaction of the air, but attributed by the natives to a poisonous plant said to grow most abundantly at the greatest elevations.

This pass is situate in latitude  $31^{\circ} 23'$  and longitude  $78^{\circ} 12'$ , it separates Choara from Koonawur, another of the grand divisions of Busahir, which lies on both banks of the Sutlej, extending from latitude  $31^{\circ} 30'$  to  $32^{\circ}$ , and from longitude  $77^{\circ} 53'$  to  $78^{\circ} 46'$ . It is a secluded, rugged and barren country, seldom exceeding eight miles in breadth. It is terminated on the north and N. W. by a lofty chain of mountains covered with perpetual snow, upwards of 20,000 feet high, which separates it from Ludak ; a similar range of the Himalayas bound it to the southward ; on the east a pass almost 14,000 feet high divides it from Chinese Tartary ; and on the west lies another of the principal divisions of Busahir.

The villages, which are elevated from 8,000 to 12,000 feet above the sea, are very thinly scattered, not more than two or three occur in a stage, and sometimes none at all for several days. In the summer season, from the reverberation of the solar rays, the heat in the bed of the Sutlej, and other large streams is oppressive, and quite sufficient to bring to maturity grapes of a delicious flavour, of which raisins and a spiritous liquor called *Rakh* are made. The inhabitants wear a frock of white blanket, often two-fold, reaching down to the knees, and having sleeves, a pair of trowsers and girdle of the same, a cap of black blanket like a bonnet, and shoes of which the upper part is woollen, and the sole alone leather. The people are very dark and extremely dirty, but they seem to enjoy a much greater degree of comfort in their habitations than any of the other mountaineers we have seen. The villages



are generally large, and the houses spacious and even elegant; they are built of stone and wood, and either slated or flat roofed, the last is most common. The temples of the *Deotas* (deities) are magnificent, and adorned with a profusion of ornaments. There are two or three in almost every village, and sundry miraculous feats are ascribed to the gods to whom they are dedicated, scarcely one of whom but has the credit of having removed some mountain or vast rock for the purpose of rendering the roads passable, or of some other like achievement.

The level spaces of land in Koonawur are few, the crops are extremely poor, and a want of grain pervades the whole country. In time of scarcity, small pears and horse chesnuts, after being steeped in water to take away their bitterness, are dried and ground into flour. There are, however, no marks of poverty, and the natives subsist by exchanging raisins and wool for grain; they have little else to do but look after their vineyards, and attend to their flocks, which in summer are sent to pasturage at some distance from the villages. Bears are very numerous, and commit great ravages; in the grape season, during the whole night, several people from each village together with their dogs, are employed in driving them off.

The dogs are of a large ferocious breed, covered with wool and extremely adverse to strangers, whom they often bite and tear in a most shocking manner; they are commonly chained during the day, otherwise it would be dangerous to approach a village. The winter is rigorous, and for three months there is no moving out of the villages owing to the quantity of snow; during this season the inhabitants employ themselves in weaving blankets. They early begin to collect their winter stock of fuel and food for their cattle, which latter consists chiefly of the leaves of trees, and they pile it upon the tops of their houses.

The Koonawur language, of which we made a collection of nearly 1,000 words, differs much from the Hindee, most of the substantives ending in — *ing* and *ung*, and the verbs in — *mig* and *nig*.\*

3rd October.—The thermometer was fifteen degrees below the freezing point, and the cold intolerable, we therefore waited till two hours after sunrise, and then proceeded to the village of Brooang, distant eight and a half miles; the road lay over a thick snow bed for the

\* This vocabulary has fortunately been preserved, and will shortly appear.—Ed.

first mile, and then led through extensive woods of various sorts of trees, amongst which we recognised the hazel, plane, horse chestnut, and many other European plants. The way was often rugged, and a steep descent of 7,600 feet perpendicular height. On the road we found black currants and raspberries in the greatest perfection, of which we preserved a large quantity, and on our arrival at camp we feasted on grapes. Brooang is a small village in Tookpa, one of the subdivisions of Koonawur, under the Wuzeer Teekumdas. It is situate near the Buspa river, and about two miles from the left bank of the Sutlej.

*4th October.*—Marched to Pooaree, a distance of twelve and a half miles. The road was extremely bad, lying often upon the face of a naked stone inclined to the horizon at a considerable angle, with a precipice of many hundred feet on the outer side; it was no great ascent or descent, but so much caution was necessary to prevent the traveller from slipping off the rocks into the river Sutlej, which lay close upon our left, that the journey took us up twelve hours. To-day we crossed the Buspa, a large stream forty two feet broad, whose source is amongst snow, five or six marches S. E. of Brooang.

*5th October.*—Proceeded to Rispè, a march of thirteen and half miles, likewise occupying us the whole day. The road which lay through thin forests of pine was not so dangerous as yesterday's, but consisted of several steep ascents and descents upon rocks of crumbling granite of 2,000 feet each. We had a grand view of the Kylas or Ruldung mountains from the large town of Reedung or Ribe, three and half miles before we reached camp; some idea of it may be formed by imagining an assemblage of pointed peaks presenting a vast surface of snow, viewed under an angle of twenty-seven degrees, and at a distance of not more than five miles in a direct line. The height of our station was 8,000 feet, and the Kylas peaks were 12,000 higher.

At Rispè we first saw Lamas, and near this place we passed several tumuli from ten to forty feet in length, two broad, and about four high, they are constructed of loose stones without cement, and upon their tops are numerous pieces of slate of all shapes and sizes carved with strange characters, they are called manè, like the *manes ai ψυχαι τῶν νεκρῶν*, or souls of the defunct, see verq. 3. *Æ.* n. v. 303. and are erected over the graves of the Lamas. There are invariably roads on each side of them, and the natives, from some superstitious custom, always leave

them on the right hand, and will rather make a circuit of half a mile than pass them on the wrong side.

*6th October.*—Marched to Murung five miles. The road was pretty good along the left bank of the Sutluj, crossing a river named Teedoong, whose source is in the Chinese dominions four day's journey to the eastward.

Murung is a Lama town of considerable size, consisting of seven or eight distinct divisions, and beautifully situated chiefly upon a southern exposure, in a glen which forms the greater part of an ellipse, through it runs a transparent stream, upon the banks of which are extensive vineyards and orchards, abundantly supplied with water by numerous rills. The dell is encircled by lofty mountains at an angle of twenty-five degrees on every side, except on the westward, where it is open towards the Sutlej, on the bank of which there is a small fort. The situation is extremely fine, and the approach to it highly picturesque, leading along the bank of a canal, and through an avenue of apricot trees. Near this place there are a great many piles of stones with inscriptions, and afterwards we met with them almost at every village, until we reached Pangee, on our return where they end. We also saw a number of temples called Chosten, which are likewise to be found in the vicinity of every Lama habitation; they consist of an enclosure formed of three walls with a roof and open in front, in the inside of them are one or more small white-washed buildings shaped like urns.

It was our intention to have proceeded further, but the people told us the next village was at such a distance, and the ascent so fatiguing, with no water on the way, that we could not possibly reach it that night.

*7th October.*—Marched to Nisung eight miles. The road commenced with a very tiresome ascent of 5,300 feet perpendicular height; here we were delighted to find numerous beds of juniper and some gooseberries, which were the first we had seen for a long period of years; we were in great hopes we should have met with heath, but saw none. At the top of Toongrung Pass, 13,739 feet high, it began to snow, and the thermometer was below the freezing point, so we were glad to make the best of our way down; the foot-path was good, but a steep descent through juniper and thyme of many kinds to Nisung, a small Lama village situate near the Taglak'har, a large stream which rises in Chinese Tartary three or four marches to the eastward. The extreme height of

this village by corresponding barometrical observations is 10,165 feet, and grapes do not ripen here. There are many gardens of fine large turnips belonging to the village, fenced around with hedges of gooseberries; the latter are of the red sort, small and extremely acid, but make a capital tart.

*8th October.*—We were delayed till 2 p. m., in order to get grain ground for the consumption of our people, there being no village at the next stage. We marched only one and three-quarter mile, and the road at first was a descent to the Taglak'har, and then a steep ascent of 2,000 feet, most part of the way up a slope of forty degrees, and over rugged rocks. We were obliged to halt here, there being no water for many miles in advance.

*9th October.*—Marched ten miles to the bed of a mountain torrent, and did not arrive till an hour after dark. This day's journey was one of the most tiresome we had experienced, crossing two mountains of 12,000 and 13,000 feet, the ascents and descents, one of which was full 4,000 feet in perpendicular height, were steeper for a longer continuance than any we had yet seen, and the path was strewn with broken slate, which gave way under the feet. Neither tent nor baggage arrived, and we had nothing to eat but cakes of very coarse meal, which hunger however made palatable; upon this kind of food, together with a few partridges which our people occasionally shot, and without either plates and knives or forks, we lived for five days. We should have afforded an amusing spectacle, seated upon blankets near a fire in the open air, surrounded by our servants, dissecting the partridges with the *kookree*, or short sword worn by the Goorkhalees, and smoking plain tobacco out of a pipe little better than what is used by the lowest classes. Novelty however has its charms, and our being in a country hitherto untrodden by an European, gave us a delight amidst our most toilsome marches, scarcely to be imagined by a person who has never been in the same situation.

*10th October.*—Marched to Dabling six and three-quarter miles. The road was pretty good, lying near the river. We went a mile out of the direct way, to visit the Namptoo Sango, a wooden bridge across the Sutlej. The river was here 106 feet broad, with large rocks in its bed, and the bridge seventy-eight feet above the stream, which rushes with rapid violence between blocks of granite. We in vain tried to measure its

depth, and although we had a heaving lead for the purpose, of no less than ten pounds weight, we could not effect it, for the force of the current was so great as to sweep it down long ere it reached the bottom. We found the bed of the river 8,200 feet above the sea.

*11th October.*—Marched to Numgeea nine miles. The footpath was good and even, lying upon the left bank of the Sutlej. To-day we made a circuit to look at the conflux of the Lee with the Sutlej. The Lee is a river of considerable breadth, coming from Ludak on the northward, but it is not very deep, and flows in a clear stream with a moderate current, whilst the Sutlej is muddy, and rushes with great velocity and a stunning noise.

Since leaving Pooaree, the trees had gradually become more scanty; in the vicinity of Numgeea there is little vegetation, grass and thyme are but thinly scattered in small tufts, and a solitary dwarf pine appears here and there.

*12th October.*—Marched to Shipkè nine miles. The road ascended a little, and then there was a steep descent into the bed of the Oopung. Here the rocks are more rugged than any we had yet seen, they are rent in every direction, piled upon one another in wild disorder, in a most extraordinary manner not to be described, overhanging the path, and threatening destruction to the traveller. From the Oopung, the road was a tiresome and rocky ascent to the pass which separates Koonawur from the Chinese dominions, 13,518 feet above the level of the sea; here the scene was entirely changed, a more marked difference can scarcely exist. The mountains to the eastward were quite of another nature from those we before met with, they are of granite broken into gravel, forming regular slopes, and neither abrupt nor rocky. The country in that direction has a most desolate and dreary aspect, not a single tree or blade of green grass was distinguishable for near 30 miles, the ground being covered with a very prickly plant, which greatly resembled furze in its withered state; this shrub was almost black, seeming as if burnt, and the leaves were so much parched from the arid wind of Tartary, that they might be ground to powder by rubbing them between the hands.

The brownish tint of the furze, together with the bleakness of the country, have the appearance of an extensive heath, and would strongly remind a Scotch Highlander of his native land. Our course from

Brooang was about N. E., here we found we had reached the northern point of the Sutlej in latitude  $31^{\circ} 50'$ , it lay about two miles upon our left hand, and from this place its direction all the way to its source in the celebrated lake of Mansurowur is nearly E. S. E.

The wind was so strong, that we could with difficulty keep our feet, and it is said to blow with almost equal violence throughout the year. We saw some snow on our right a little below us, and beyond it a peak above 20,000 feet high, off which the snow was drifting in showers, from the force of the wind. From the pass to camp, the road was a moderate descent upon gravel, winding very much.

Shipkè is a large village in the district of Rongzhoong, under the Deba or Governor of Chubrung, a town, or rather collection of tents on the left bank of the Sutlej, eight marches to the eastward. The houses here are very much scattered, and are built of stone with flat roofs, there are gardens before each hedged with gooseberries, which give them a neat appearance. This is a populous place; we counted upwards of eighty men, who on our arrival came to meet us, being the first Europeans they had ever seen.

The Tartars pleased us much; they have none of that ferocity of character so commonly ascribed to them; they have something of the Chinese features, and their eyes are small; they go bare-headed even in the coldest weather, and have their hair plaited into a number of folds ending in a tail two or three feet long. Their dress consists of a garment of blanket, trowsers of striped woollen stuff resembling Tartan, and stockings or boots of red blanket, to which are sewed leather shoes; most wear necklaces, upon which are strung pieces of quartz or bone; they have also knives in brass or silver cases, and all carry iron pipes of the same shape as those used by labourers at home, and the higher classes have them ornamented with silver; in common with the inhabitants of Koonawur, the greater part of them have a flint and piece of steel for striking fire, attached to their apparel by a metal chain. The women whose dress resembles that of the men, were literally groaning under a load of ornaments, which are mostly of iron or brass, inlaid with silver or tin, and beads round their necks, wrists, and ankles, and affixed to almost every part of their clothes.

*13th October.*—Halted. My brother took a walk of about a mile farther on, with the perambulator and pocket compass, for we did not think it

advisable to use the theodolite in the presence of the inhabitants, knowing their extreme jealousy; he had proceeded a little way from the village before he was perceived, when immediately the people dispatched a couple of horsemen after him, and crowded round the tent, making a great uproar. My brother had begun to return before the horsemen overtook him; they told him they had come to bring him back, but seemed in perfect good humour, laughing whilst they spoke; they insisted upon his going before them, and would not dismount when he bid them.

About 9 o'clock, the Chinese Officers, of whom there are several to regulate the affairs of the country, brought sixteen seers of flour, which they requested us to receive as a present, and it was no unacceptable one, for our people had had but little food for the last three days. In the forenoon, the principal Officer shewed us a long piece of parchment, written in what we supposed the Chinese character, and gave us to understand it was an express order from the Garpan of Garoo, under whose authority the Debas are, prohibiting strangers from entering the country; he at the same time said, we had so many people with us, (having nearly 100,) that he could not oppose our progress, but it would cost him his head if he gave us the means of going on, so he would not supply us with provisions, which was the most effectual mode he could have adopted to stop us.

During the time we were at Shipkè it blew a complete hurricane, and the aridity of the wind dried up every thing exposed to it; the leaves of our books were more bent than I ever remember to have seen them in the hot winds, and no dew was observed.

The lat. of Shipkè by meridian altitudes of stars is  $31^{\circ} 48'$ , and the long.  $78^{\circ} 48'$ , its extreme height is 10,527 feet, and the thermometer ranged from  $38^{\circ}$  to  $60^{\circ}$ .

The people are affable and good natured, and allowed us to handle their pipes, knives, &c.; they thronged round our tent from morning till night, and we found it the most difficult thing to understand them even with the aid of interpreters, for the Koonawur words we had picked up, which were of the utmost use to us during our tour, were not intelligible here. This evening the articles that had been so long in the rear came up.

14th October.—At sunrise, when the thermometer was  $31^{\circ}$ , and before the inhabitants had risen, I set up the theodolite and took the bearings

and altitudes of the remarkable peaks; one of them covered with snow above 20,000 feet in height, is only 4 miles from the village from which it subtends an angle of 28 degrees; another called Tuzheegunj, 22,488 feet high to the north of the Sutlej, was seen under an angle of  $23^{\circ} 31'$ , these elevations were observed with the sextant and artificial horizon.

We exchanged a gold button for a goat, which we took with us to Soobathoo; the wool is extremely fine, and almost equal to what is used for the manufacture of shawls; we were informed the best was procured further to the eastward near Garoo, which is the famous mart for wool. The goat scarcely differs from the common one, and it does not appear to be a distinct breed that produced the shawl wool, but its fineness seems to depend almost entirely upon the elevation and coldness of the climate. We ourselves had an opportunity of seeing this at Soobathoo, 4,200 feet above the sea, the wool is little better than in the plains of Hindoostan, but it gradually grows finer as you ascend, and in Koonawur, where the villages are more than 8,000 feet high, it is fit for making coarse shawls.

Garoo or Gartop, by the accounts of fifteen different people, is reckoned 11 marches from Shipkè, and the road consisting of gentle swellings, is described as being so good, that the trade is carried on by yaks.

After breakfast, we returned to Numgeea by the same road as before, and on the 15th of October struck off to the N. W. towards Ludak, crossing the Sutlej a mile from the village by a crazy bridge, constructed of ropes made of the bark of a tree, with basket-work of twigs forming a curve almost the sixth part of a circle. The breadth of the river was 74 feet, including a large rock in the middle occupying 42 feet, the extreme height of the bed is 8,600 feet. This day we travelled  $7\frac{1}{2}$  miles, passing over a mountain of 13,186 feet, the ascent of which was very steep upon rugged rocks, and above 4,500 feet. We encamped near a stream at the height of 12,800 feet, and had but a small supply of fire-wood, the country producing nothing but the prickly bush before-mentioned, and another not unlike broom.

16th October.—Seeing high mountains to the eastward, which appeared to be practicable, and thinking the distance short, we resolved to attempt them whilst our baggage proceeded direct to Mako, only about 3 miles from our camp. We accordingly set off after an early break-



fast, and went up the face of a steep hill for  $1\frac{1}{2}$  mile, sometimes over large misshapen masses of granite, sometimes upon a gravelly soil covered with brown furze and various kinds of aromatic shrubs. There was not the least trace of a foot-path, and the prickly bushes impeded us not a little, every moment running into the feet through the shoes which were of the kind used by the natives, our own stock, from the badness of the roads, having been long since worn out. The height of this station was 14,900 feet. There being another higher peak without snow that seemed near, we moved towards it, but were never so much deceived in distance, it took us full three hours to reach its top, and the ascent was very tiresome, lying over enormous detached blocks of stone, often resting upon small bases, tottering under the feet, and seeming ready to overwhelm us; the last 200 yards were still worse, and we were obliged to use both hands and feet, now climbing up almost perpendicular rocks, and now leaping from one to the other; a single false step might have been attended with fatal consequences, and we had such severe headaches, and were so much exhausted, that we had hardly strength sufficient to make the effort, and it required no inconsiderable one to clear the deep chasms which we could scarcely view without shuddering. I never saw such a horrid looking place, it seemed the wreck of some towering peak burst asunder by severe frost. After much delay, we got up the theodolite and a couple of barometers, at 4 P.M. the mercury stood at 16.170 inches, and the thermometer was  $29^{\circ}$ , which compared with corresponding observations made at Soobathoo, gives the height 16,921 feet. We observed all the surrounding peaks, and then proceeded to the village of Nako at a quick pace, the road for the first mile was a steep and rocky descent, afterwards a more gradual one to camp, where we arrived at dusk. The distance by perambulator was ten and half miles, but we must have travelled upwards of eleven, for the wheel could not be rolled to the top of the highest peak.

*17th October.*—From what we saw yesterday, we were convinced we could reach a more elevated spot, and thinking the attainment of a great height more desirable than a high latitude, we resolved to try it again, and rather defer our intended journey towards Ludak, than let slip such a favourable opportunity. From our experience of the slowness with which the perambulator can be rolled over the large

stones, we sent it together with the large theodolite a-head at 8, and moved ourselves at 10. The road at first was tolerably good, lying upon turf and passing some lakes which were frozen over, latterly it was rocky and the ascent fatiguing, but not near so difficult as yesterday's. We stopped several times to look out for our people, but not seeing any sign of them, we dispatched a man to Nako with orders to bring our bed clothes, a few bundles of fire-wood, and some food to meet us, whilst we proceeded on to a kind of break between two peaks. The last half mile was generally over snow, and both my brother and I felt completely debilitated, and were affected with severe headaches and pains in the ears; the highest vegetation we saw was a plant with leaves like sage, but without smell, it grows at the height of 17,000 feet, beyond which elevation we found no soil. At the top of our station between the peaks, the barometer shewed 15.075 inches, which gives the height 18,683 feet. The thermometer when first taken out of the case was 30°, but in less than a quarter of an hour, it fell to twenty-two degrees below the freezing point. After taking a few bearings, with all possible haste, we set out on our return, and at dark met our servants with our bed clothes  $1\frac{1}{2}$  mile from Nako, and halted for the night at the height of 13,724 feet without a tent. Our people had brought wood, but not flint to strike a light, we therefore sent them back to the village for some fire. It was past 11 before they returned, and during an interval of near 5 hours, we sat shivering with cold, for the thermometer was 6° below the freezing point, and we had only a couple of blankets each to wrap round us. After we had lighted a fire, we made a large quantity of punch, which we continued drinking till near two in the morning, and I do not recollect any thing that ever refreshed me so much.

The length of our march to-day was about ten miles, and we ascended 6,800, and descended 5,000 feet perpendicular height. The people with the perambulator and theodolite missed the way, and did not arrive till midnight, and their hands and feet were almost frozen.

*18th October.*—The thermometer at sunrise was 16°, and the cold intense, we could not sleep much owing to it, for excepting a few sticks which we kept for the purpose of preparing breakfast, our firewood was exhausted.

We wished much to see the barometer below fifteen inches, and determined to make another attempt to reach the summit of a peak north

of our yesterday's station, which appeared 600 or 700 feet higher. Being now one and a half miles nearer to it than before, we had every hope of succeeding, so sent off the articles we required there as soon as we could prevail upon our people to move, which was not, however, before 9 o'clock. We were well equipped with instruments for making all requisite observations; we took three barometers, two thermometers, a large theodolite and a small one, a perambulator, a telescope magnifying eighty times, and a smaller one, together with a bundle of sticks to try the boiling water, and a sextant and artificial horizon, with us. We marched a little after ten, and overtook our people not a mile from our halting place; we had infinite trouble in getting them to go on, and were obliged to keep calling out to them the whole way, at one time threatening, and at another coaxing them; to tell the truth, however, we could not have walked much faster ourselves, for we felt a fulness in the head, and experienced a general debility, which together with headaches and pains in the ears and breast, affected us more than the day before. A cold wind that benumbed our hands sprung up, and increased with our height till about 3 P. M., when it died away. After much annoyance, we reached the place where we put up the barometer yesterday, here the man who carried the bundle of sticks sat down and said he must die, as he could not proceed a step further, and neither threats nor the promise of a handsome reward could induce him to move; we accordingly left him, and after an ascent of 700 feet, attained the top of the peak, 19,411 feet above the level of the sea. The road latterly lay over disunited blocks of granite, between which we found large lumps of ice transparent as crystal; we got up the last ascent without much difficulty, which is somewhat surprising. It was 4 P. M. when we gained the summit, so we had no time to make half of the observations we wished; the thermometer was not below twenty-two degrees, but from the wind on the way up, our hands were so numbed, that it was not until we had rubbed them for sometime that we got the use of them. Whilst I was setting up the large theodolite, my brother tried three excellent barometers, which we had the satisfaction to see stand exactly at the same point, 14,675 inches. The Turkeegung mountain had an elevation of seventeen degrees, and was not more than two miles distant; the ink froze, and I had only a broken pencil with which I got on very slowly. It was twenty minutes to five before

we had finished our observations, the thermometer was eleven degrees below the freezing point, the cold increasing every instant, and we had 7,600 feet to descend, over a bad road, in a distance of six miles. We cautioned our people against delay, and moved downwards as fast as we could walk; we passed the bundle of sticks where it was left, but the man had disappeared, and we next day understood he had reached camp before us. Night overtook us two and half miles from Nako, and my brother had the misfortune to fall and hurt his leg so much, that we greatly feared he would be obliged to remain where he was until assistance could be obtained from the village; after sitting down for half an hour, he found himself able to proceed at a slow pace, so we moved on, and shortly after lost the road by going too far to the right. We got in amongst a confused jumble of gigantic masses of rock, from which we found it no easy matter to extricate ourselves; we wandered about amidst them almost as chance directed for one and half-hours, many of the stones shook under us, and we passed places frightful even in daylight. About nine we espied a light below us, and heard the roaring of the Lee river, which seemed quite close; it being then calm, this made us imagine we had gone beyond the village, but judging from the strange structure of the surrounding mountains which we could scarcely mistake, we thought it impossible we could have done so, more especially as we had seen no cultivation, and there are a good many fields around Nako; we therefore went on and arrived at a Lama's temple that we recognised about a quarter of a mile from camp; we called out, and were answered by some of our people, who came to meet us with a couple of lights. We reached camp at half-past nine, not so much tired as might have been expected; only four of our servants arrived that night, the rest stopped without firewood at our former halting place, and came up late next day, having their feet so much swollen by the frost, as to be unable to carry loads during the rest of our journey. The distance to-day was ten and a half miles. Our last three marches were fraught with accidents; three barometers, a perambulator, and thermometer were smashed in pieces, and the small theodolite, a very neat instrument by Dolland, was rendered unfit for taking elevations, the nonius having been broken off; we had remaining two theodolites, a surveying compass, four barometers, and as many thermometers, a strong perambulator, a couple of sextants, a reflecting circle, a repeating

one, and a chronometer, so we were still very well supplied with instruments.

We had great reason to be thankful, that during these last three days there was very little wind, and none at all when we visited the highest peaks, for had there been any when the thermometer was so low, it must have chilled us, so that we could not have moved, and to have remained at such heights for a night, would have been almost certain death.

*19th October.*—As many of our servants were unable to walk, from fatigue and sore feet, we halted. The village of Nako is situate about a mile to the east of the Lee river, and is the highest we met with during our tour, being not less than 11,850 feet above the sea; it is pretty large, and inhabited by Lama Tartars, rather different in appearance from those at Shipkè, and not so much resembling the Chinese; there is more cultivation about it than would be expected considering its elevation, the fields which are chiefly wheat and a kind of pulse, extend to the height of 13,000 feet, and have stone dykes around them; yaks are used here in the plough, they are hardy animals, but often vicious. The grain produced, as at most other villages in Koonawur, is insufficient for consumption, and the people subsist by their flocks; there is a pond near this, surrounded by apricot trees, upon which in winter the boys amuse themselves by sliding, but they do not know the use of skates.

This morning the thermometer was eighteen degrees below the freezing point, a shower of snow had fallen upon the adjacent mountains, and every thing indicated the sudden approach of winter; it was now time for us to think of returning, so we decided upon going no farther than Shealkhur. We here received a visit from the Wuzeer Loktus, who has charge of Hungrung, one of the subdivisions of Koonawur, containing ten or twelve Tartar villages, which lies on both sides of the Lee river from Shealkhur to the Sutlej; he came here to collect the revenue, and brought us a couple of *chowrees*, and some fine purple grapes from Soongnum.

*20th October.*—Marched to Chango nine miles, the road was in general good and broad, lying about a mile from the left bank of the Lee river; we found a great deal of red clay at the height of 12,000 feet, and above the hills, were of granite and gneiss. Chango is situate on a pleasant spot between two rivulets near the Lee.

**21st October.**—Marched to Shealkhur, a fort and village belonging to Busehur, under charge of Loktus ; its distance from Chango is three and half miles ; the road was rocky upon the left bank of the Lee, until under the village, where we crossed it by a bad wooden bridge, the bed of the river is here 10,000 feet above the sea, and the breadth of the stream 92 feet ; but it is not nearly so deep or rapid as the Sutlej.

The fort of Shealkhur is situate in latitude  $32^{\circ}$ , and longitude  $78^{\circ} 38'$ , upon the confines of Ludak and Chinese Tartary ; it is in a most ruinous state, and the village is a poor place.

The first Ludak village was said to be a day's march to the northward, but as a single fall of snow might have shut the passes, we gave up the idea of visiting it.

From Koonawur to Garoo there are three roads, one from Shipkè has already been mentioned, another from Shealkhur not so good as the former, lies through Choomoortee, an elevated country under a Deba, where the people dwell in tents, do not cultivate the ground, but subsist by their flocks ; the third road from Nisung crosses part of the Himalaya range at a pass called Gangtung, which is represented as being extremely difficult. It is worthy of remark, that the Koonawurees estimate the height of mountains by the difficulty of breathing they experience in ascending them, which, as before noticed, they ascribe to a poisonous plant, but from all our enquiries, and we made them almost at every village, we could find nobody that had seen the plant, and from our own experience, we are inclined to attribute the effect to the rarefaction of the atmosphere, since we felt the like sensation at heights where there were no vegetable productions.

The traders who cross Gangtung Pass put on so many clothes to defend themselves from the excessive cold, that they can scarcely walk : they wear a large garment with sleeves reaching almost to the feet, made of sheepskin with the woolly side inwards, trowsers and stockings of the same material, a kind of rude gloves of very thick woollen stuff, and caps and shoes of blanket ; they likewise occasionally wrap three or four blankets round them, and thus accoutred, set out on their perilous journey. No herbage is met with on the way for two days, and travellers are said to have dreadful headaches, and pains in the ears even when at rest ; many goats and sheep die annually, and it is no uncommon thing for the people that attend them, who also some-

times perish, to lose their fingers and toes. This road leads past Chubrung, and crosses the Sutlej at Chuksum *Sango*, a wooden bridge with a railing of iron chains, under Tooling a large collection of tents, where there is a temple with a gilt cupola roof held in great repute amongst the Lamas. Leh, or Leo, the capital of Ludak, on the right bank of the Indus, is reckoned sixteen day's journey from Shealkhur. There are several roads from Koonawur to it, one from Wangpo, another from Soongnam, and two from Shealkhur; they are rocky at first, but afterwards improve. Leo is about midway between Kashmeer and Garoo, being eighteen marches from either.

*22d October.*—Proceeded to Lee, a village on the right bank of the Lee river, near the junction of a small stream with it. The distance is twelve miles, and as it was late when we started, we did not reach it until upwards of an hour after dark, and half our baggage did not arrive that night. The road was bad, crossing two rivulets, the ascent from the latter of which was extremely tedious and dangerous, being very steep upon sand and gravel that seemed to have but lately fallen; it was a natural slope, and much caution was requisite to avoid putting the loose earth in motion, for there were no marks of a foot-path; with all our care, however, it was not unfrequent to slip back many yards, and sometimes near a hundred feet of sand gave way at once, carrying the traveller with it, but not very quickly; the greatest danger arose from stones displaced by our people who were a-head, which every now and then whirled past us with astonishing rapidity.

*23rd October.*—Marched seven and a quarter miles to Hango, situate on the bank of a stream flowing to the eastward to mix its waters with the Lee. This valley contains five or six villages, around which there is more cultivation than we had often seen in Koonawur. The road commenced with a steep ascent of 2,500 feet, and then was good and even to Hango, 11,468 feet above the sea.

*24th October.*—Marched to Soongnum nine and a quarter miles; at first we had an ascent of 3,400 feet by a good but steep road to the top of Hungrung Pass, 14,837 feet in height; this pass separates Hungrung from another of the divisions of Koonawur, named Soocè or Shouung, under the Wuzeer Budreedas; the mountains immediately on either side might be fully 1,000 feet above us, but there was little snow upon them.

and none at all in the pass itself. The wind blew with irresistible violence, and although the thermometer was four degrees above the freezing point, it chilled us so much, that the numbness of our hands continued almost until we reached camp, to which we descended by a good broad road cut into long zigzags, and crossed by some rivulets entirely frozen.

Soongnum is a town of considerable extent and beauty, it is situate on the point under which the Darboong and Bonkeoo unite, the former is a stream of some size, and comes from the N. W., the latter is small, and has its source near Hungrung Pass. The dell through which the Darboong flows is broad and level, and almost an entire sheet of cultivation for about three miles; it is a beautiful spot, and the extensive vineyards and number of apricot trees have a fine effect; it is shut in to the north and south by mountains not under 14,000 feet, to the N. W. is a steep and high pass to Ludak, and on the eastward lies the Sutlej, which the Darboong joins under the village of Sheasoo, four or five miles further down the glen.

Soongnum is inhabited chiefly by Lamas, and its extreme height is 9,340 feet. Trees which we had not seen since we left Numgea, appeared in this vicinity thinly scattered upon the surrounding mountains, they consist of keloo or kelmung and ree, both varieties of the pine; the last kind which produces the neoza almond in shape, resembling the pistachio nut, and in taste not inferior, is peculiar to Koonawur, and does not grow to the westward of the Buspa or Wangpe rivers.

In the evening we were entertained with a Lama concert, which was far from disagreeable, the music was high and low alternately, one set singing the bass and another the treble.

25th October.—After crossing the Darboong by a good *sange* we marched to Lubrung, a distance of ten and a half miles; the road was good, winding very much, and crossing the Roonung Pass, 14,508 feet high, at the top of which the wind was as strong and cold as yesterday. We found a great deal of juniper on the way, and the berries were large and well tasted, having little bitterness.

Labrung is a large village upon the right bank of a rivulet called Zong, a couple of miles from the Sutlej, and 9,296 feet above the sea; opposite to it, and a mile distant, is the populous town of Kanum, where



the Wuzeer Loktus resides during winter; there are two brothers, named Buleeram and Busuntram, but they are both generally called Loktus, which word properly speaking, should be applied to their house, a building of great extent.

*26th October.*—Marched to Leepè six and a half miles, the road was bad, lying upon sharp rocks. The houses here, as well as at Labrung, are wholly composed of wood, they are small, and in shape exactly resemble cisterns. Leepè consists of an upper and lower division, both of which contain a good many inhabitants; it lies upon the left bank of the Tetee, a large stream, having its source amongst snow twelve or fifteen miles to the N. W. The vineyards are numerous, and the grapes large and of a delicious flavour.

*27th October.*—Marched to Akpa ten and three-quarter miles. The road was rocky, passing the village of Jangee, and for the last four miles led through forests of pine upon the right bank of the Sutlej, about a mile from the stream.

*28th October.*—Proceeded to Pangee ten and three-quarter miles. The footpath was rugged in the extreme, lying a great part of the way upon fragments of granite and gneiss, which appeared to have but lately fallen, and exhibited a heap of gigantic ruins, amongst which we saw many a noble pine lying prostrate, whilst a few with their branches broken off and otherwise disfigured, just barely peeped above the stones. Large portions of rock fall yearly, and their effects are truly dreadful, they sweep every thing with them, and sometimes stop the channels of the largest rivers for weeks.

From Leepè to this place there is a direct road not exceeding fourteen miles, but we chose to go round by the Sutlej, in order to have a better view of the Kylas peaks.

*29th October.*—Marched to Rogee nine miles. The road was first a very steep descent of 1,000 feet to the Mulgoon, a large stream descending at a considerable angle, rushing over rocks with rapid force, and forming a series of cascades; we crossed it by a couple of *sangos*, the current being divided into two; the ascent from it was fatiguing for a mile, the road then for the next five miles was excellent, leading upon soil through woods of pine, the trees of which attain a large size, but not quite equal to those near Brooang, one of which measured thirty-three feet in circumference; the last one and half mile was of an extraordi-

nary nature along the brink of a tremendous precipice, and often upon unsteady scaffolding that has been constructed with very great labour, this continues for several hundred yards together, and is formed of spars driven into the crevices of perpendicular faces of rock, with their other ends resting upon trees or posts and boards across. Now and then you meet with a rude stair of wood and stone, which must have required much trouble to erect; the rocks project above the path, and the traveller is frequently obliged to stoop in order to avoid them, whilst at the same time he must pay equal attention to his footing.

Part of the road was destroyed last rainy season, and had not upwards of twenty people been early sent off to repair it, we should have been forced to go by the Sutlej, which is nearly a whole march round; by the time we arrived at the place that had given way, they had made several clumsy wooden ladders, which answered our purpose tolerably well. The mountains latterly on either side of the river are craggy, rent in every direction, almost destitute of soil, and thinly wooded, but in the vicinity of Kushbeer, which we passed half way, the ground slopes gradually to the Sutlej at some distance, and is thickly studded with hamlets and adorned with vineyards.

There are several orchards belonging to Rogee, which contain apples of an excellent kind, nearly as large as those brought from Kabool, which they far excel in flavour.

*30th October.*—Proceeded to Meeru eight and half miles. The road was very uneven upon angular pieces of quartz, gneiss, and granite, often bordering upon a precipice about a mile from the Sutlej, here called Sumudrung. The rocks on our right hand were of the same cracked appearance as yesterday, frequently overhanging the path, and menacing destruction to the left; towards the river the declivity is more gentle, and generally clothed with pines, unless where they have been buried amongst rocks dislodged from above.

Meeruo is situate in the district of Rasgramee, and is 8,550 feet high. Besides the subdivisions of Koonawur already noticed, there are three more, Utharabeesht on the southern bank of the Sutlej to the westward of Brooang, Pundrabeesht opposite it on the north side of the river, and Wangpo, containing only seven small villages to the N. W. of Meeruo.

*31st October.*—Marched seven and three-quarter miles, and encamped near a cave close on the right bank of the Sutlej. The pathway was

indifferent, ascending and descending alternately, and passing the village of Chegaon or Cholang, pleasantly situate near a stream five miles from Meeroo; half a mile on this side of it the road led through an arch formed of two stupendous rocks of granite, which meet at an angle.

*1st November.*—Marched to Nachar eight miles. The way was rough for four miles to the Wangpo, a large mountain torrent that rushes down a steep declivity, forming a succession of waterfalls in its course, and dashes against the huge masses of rock in its bed with a noise like thunder, throwing up the spray to an amazing height; we crossed it by a good *sango*, and proceeded half a mile upon level ground to Wangtoo Jhoola, a rope bridge over the Sutlej; it consists of five or six cables close together, upon which is laid half a hollow fir tree, about two feet long, with pegs driven through it to prevent its coming off; from this hangs a loop of three or four ropes in which the passenger takes his seat, it is pulled across by two pieces of rotten twine, that from constantly breaking occasion this to be a tedious mode of transporting baggage. The conveyance is a pretty safe one, but greatly alarming to a novice, for the Jhoola is elevated twenty feet above the stream, which runs with great rapidity and a deafening noise. Near this are the remains of a wooden bridge, such as described in Captain Turner's Narrative, that was destroyed on the Goorkha invasion of Busahir. We found the breadth of the Sutlej at the bridge eighty-eight feet, and the height of its bed 5,200 feet, in some parts it is scarcely fifty feet broad, and it was in attempting to swim over at a narrow place that one of my servants was drowned here last year.

After much delay, we got every thing across without an accident, and ascended for three and a half miles to Nachar, where there are a few grapes which seldom ripen; the degree of cold does not depend nearly so much upon the absolute height of the place, as its elevation above the bed of a river, for vines come to maturity upon the banks of large streams, 9,500 feet from the level of the sea, and Nachar does not exceed 7,000 feet in height.

*2nd November.*—Proceeded eight miles to Turanda in Utharabeesht, and three miles from the western limit of Koonawur. This day's march was beautiful, for the first three and a half miles upon soil and through shady groves of lofty pines, from twenty to twenty-seven feet in circum-

ference, the road then was a rocky descent of one and a half mile to the Syldung, a rapid torrent dashing over large stones, and coming from the Himalaya mountains to the southward; we crossed it above the union of two streams by a couple of bad *sangos*, and then ascended from its bed by a rocky footpath, winding amongst extensive forests of oak, yew, pine, and horse chesnut to camp.

*3rd November.*—We were detained by a heavy fall of snow and hail, which lay around us in large quantities many hundred feet below the village; had this shower come on ten days ago, we should have been prevented from crossing the passes near Soongnum, which together with those above 13,000 feet, are blocked up for four months in winter.

*4th November.*—Marched to Soorahun thirteen miles. It took us almost the whole day to perform the journey, for the path which is at all times dangerous from often lying near a precipice upon smooth stones, by the late shower of snow, now frozen hard, had become so slippery, that we could get on very slowly.

We crossed four streams of some size, besides many smaller ones, they are all rapid, but of no great depth. The mountains near this are heavily wooded to their summits, the cultivation increases at every step, and the villages are most thickly scattered.

Soorahun is 7,248 feet above the sea, in Dusow, one of the large divisions of Busahir; it is the summer residence of the Rajah and most of his Wuzeers, who stay here six or seven months in the year to avoid the great heats at Rampoor; it contains several good houses, and a temple attended by Brahmins.

*5th November.*—Marched to Dhar nine and a half miles. The road was bad crossing the Munglad, a rapid torrent, by a rotten *sango*, consisting of two fir trees, about a foot apart, with small twigs and slates laid across, one of the spars is much lower than the other, and the bridge is both unsteady and unsafe; the descent to the stream was at such a great angle, that we frequently slid many feet at a time, the ascent was equally bad, lying upon pure mica, shining with a bright lustre, and extremely slippery.

*6th November.*—Marched to Rampoor, distant eight and a quarter miles. The road was sometimes rugged; but more commonly even; part of the way it was a complete swamp, lying through rice fields intersected by many rills.

Rampoor is situate in latitude  $31^{\circ} 27'$  and longitude  $77^{\circ} 42'$ , on the left bank of the Sutroodra or Sutlej; although the capital of Busahir it is not near so populous as might be expected. There are several fairs here during the year, to which the Koonawurees bring blankets of various sorts, coarse shawls, wool, raisins, salt, borax and chowrees, and exchange them for wheat, tobacco, sugar, swords, &c. The houses may be about a hundred in number, they are large, well built, and covered with thick slates of a brownish colour, which form very heavy roofs; upon a few of the houses the slates are cut into oblongs, and laid regularly, which give them a neat appearance, but by far the greater number are of all shapes and sizes, and put on without any regard to order. Under the rajah's palace, a handsome edifice at the northern angle of the town, there is a rope bridge similar to the one at Wangtoo across the Sutlej leading to Kooloo, the breadth of the river is here 211 feet, and the *jhook* is elevated thirty feet above the stream, which in the rainy season is said to come within four feet of it. In December and January when the river is at its lowest, people sometimes cross upon inflated skins. We found the bed of the Sutlej by barometrical observations 3,260 feet above the level of the sea.

The site of Rampoor is low and much confined, and one of the worst that could have been fixed upon, and from its being encircled by high mountains subtending an angle of between twenty and thirty degrees, a breath of wind can scarcely ever reach it; there is little soil and no wood upon the surrounding hills, and large portions of naked rock appear on every side of the town, which being once heated, retain their warmth for a long time, so that in summer the nights are not much cooler than the days, and from there being no circulation of air, the place for several months in the year is like an oven.

*7th November.*—Marched to Nirt upon the left bank of the river. The distance is twelve and a half miles, and the road for the first four and a half consisted of short rocky ascents and descents to the Nouguree, a large stream coming from the eastward; we crossed it by an excellent high *sango* with a railing, and the rest of the way was quite plain, lying near the Sutlej.

The extreme height of the bed of the river opposite to the village is 2,912 feet, and as this is the last place where we had an opportunity of

measuring it, I shall now endeavour to give some idea of the probable height of Mansurowur Lake.

The Sutlej has a variety of names, being called Sutlooj, Sutroodra, Sumudrung, Sampoo, Langzhing-kampa, Muksung, and Zung-tee in different parts of its course; Sutroodra is most commonly used, by which name it is known from its source to the plains. In the Koonawur language, the words Sampoo, Sumudrung, Kampa, Muksung and Tee, all signify river. Zung means gold, and with the addition of the latter word is applied to the stream at a sandy place near Murung, where gold dust is found. By the accounts of many people who have travelled along its bank to its source, it issues from Lake Rawunrud, called also Rawathud and Lanka, which was confidently said by every body I saw that had been there, to communicate with Mansurowur, although Mr. Moorcroft could not discover the outlet of the latter lake; the circuit of Rawunrud was represented to be no less than seven days' journey, but it is most likely both lakes were included.

From Nirt to Sundum Sango under Numgeea, the horizontal distance by the map is seventy-two miles, although by the road it is almost 140, the difference of level of the bed of the Sutlej in this space is about 5,690 feet, which gives the fall of the river nearly eighty feet per mile in a direct line, from Numgeea to Mansurowur, which is placed agreeably to Major Hearsey, (I fancy not far from the truth, as its position with regard to Shipkè agrees well with the accounts I received,) the horizontal distance is about 167 miles; if therefore only thirty-five feet per mile be allowed for the fall of the river from Numgeea upwards, it will give the extreme height of Mansurowur or Mapang Lake above 14,000 feet, and I am inclined to think this estimate rather under the truth than otherwise, for Mansurowur is unquestionably very elevated, from the circumstance of four large rivers, and perhaps five, taking their rise in that quarter.

1st.—The Sutlej issuing from the lake itself.

2d.—The Sind or Sing-kechoo, known likewise by the name of Sind-ke Kampa, has its source N. E. of Mansurowur. It is described as a very large river, and the principal branch of the Indus, being frequently called Attuk even near Caroo, three marches to the eastward of which it passes, running close south of the capital of Ludak, and three or four days' journey to the northward of the valley of Kashmeer.

3d.—The Tamjoo Kampa springs from the mountains east of Mapang, and at first flows towards the eastward.

4th.—The Manja-choo, or Kampa, rises south of Mansurowur and runs S.E. The latter two rivers I conclude to be the Bruhmapootr and Gogra.

I likewise heard of a fifth river (but only from the accounts of one person, which however I have not the least reason to doubt, as he travelled the road twice,) said to be crossed eight or ten marches E. N. E. of Garoo; its source is reckoned near Mapang, and it runs N. E., so is perhaps one of the great Chinese rivers.

8th November.—Marched eight and three-quarter miles to Kotgoor, where there is cantonment for two companies of the 1st Nuseeree Battalion. The road at the beginning of this-day's journey lay close upon the left bank of the Sutlej, and then was a steep ascent of 3,500 feet, latterly winding amongst beautiful woods of oak, yew, and pine.

10th November.—Proceeded seven and quarter miles to Kutoo, in order to make some astronomical observations, and get the bearings and altitudes of the surrounding objects. The ascent from Kotgoor is not less than 4,000 feet, the road at first was good, but afterwards steep and rugged. Kutoo consists of two small forts upon the top of a hill, 10,600 feet above the level of the sea, connected on the N. E. with the snowy mountains. The prospect from this spot is very extensive; upwards of fifty forts, with from four to six towers each, may be distinctly counted in the Rajships of Kooloo, Sooked, and Mundee, N. W. of the Sutlej, beyond these are seen high mountains covered with eternal snow; to the N. E. and East, appear the outer range of the great Himalaya chain, extending until it is lost in the horizon, whilst to the South and S. W. the hills decrease in height to the plains, which are clearly distinguishable at a distance.

We were detained here until the 16th, for we were involved in mist for several days, during which time we could not see half a mile on any side; the thermometer did not get above 34° in a house, with a large fire for two snowy days, and at sun rise was 28°, but when the clouds cleared away, it rose to 40° and 41° at noon.

After completing our observations, we returned on the 16th to Kotgoor, where we stayed a couple of days, and on the 19th marched to Jeemoo nine and half miles. The road for about four

miles was generally good, passing many villages, and lying upon the face of a left hand range covered with dark forests of various sorts of trees to a small stream, from whence there was a steep ascent of 2,400 feet through a thicket to Nagkanda Pass, 9,000 feet high, here we found a great many hazel trees, but all the nuts were rotten; from the pass to camp, we had a moderate descent of three miles upon the slope of a grassy range that lay upon our right.

*20th November.*—Marched to Muteeana nine miles. The road for near six miles was good, upon the right bank of a rivulet, and crossed by many brooks to Mandunee, where there is a handsome temple built in the Chinese style; after leaving it, we crossed the Kuljehur, a stream coming from the northward that divides Koomarsaen from Keoonthul, two small states under chiefs called Ranas. Keoonthul is largest, and extends from Muteeana to the vicinity of Soobathoo. The descent to the Kuljehur was steep, and the ascent equally so, each about 1,000 feet. The mountains we passed are wooded with pines and oak in the vallies, but above produce little except grass.

*22nd November.*—Marched to Bunee fourteen and three-quarter miles. The road consisted of easy ascents and descents near the top of a range upon soil, and through a very highly cultivated country abounding with villages.

*23d November.*—Proceeded to Simla eleven miles, and next day made a forced march of twenty-two and a half miles to Soobathoo; the latter part of the road has already been described.

Throughout the above mentioned tour, the road was surveyed with some care, and a number of points were fixed trigonometrically, which agree well together; we were very lucky in having clear weather, and always managed to get two, but most commonly three or four meridian altitudes of stars, both north and south, contained in Dr. Pond's catalogue, at every halting place except one.

We had two sextants, and a Troughton's reflecting circle having a stand, with the last of which instruments the latitudes were usually observed. We carried no less than fourteen excellent barometer tubes with us, only two of which returned in safety. The mercury was revived from cinnabar, and was well boiled in the tubes, the last indeed was a most laborious business, for we broke upwards of a dozen of tubes in the operation. The most convincing proof that the air was entirely expelled,



is, that the mercury in the tubes of thirty-two and twenty-six and a quarter inches stood exactly at the same point, although the vacuum in the short ones was not more than three-quarter of an inch, and on applying a candle to the top, the mercury rose a little, whereas had there been the least air, it must have sunk from the expansion, which would have been clearly perceptible in so small a space.

The largest theodolite was constructed by Troughton, and is graduated, both vertically and horizontally, to twenty seconds; the elevations of most mountains subtending small angles were taken with it, and those above ten degrees, were observed either with the sextant or circle and artificial horizon.

At every camp we tried the height of the boiling point with two good thermometers, which very seldom indeed gave the altitude of the place 300 feet different from the barometer, and had we arrived at our ground in sufficient time to distil water, I have every reason to think the disagreement would have been less, for wherever we had an opportunity of using snow, the coincidence of the two methods was most satisfactory.

The height of the colossal Tuzheegung, whose summit is almost 22,500 feet above the level of the sea, was determined by angles of elevation between four and twenty-four degrees, taken at eight different stations, varying from 9,000 to 19,000 feet in height, and from two to about thirty miles distant from it, and allowing one-fifteen terrestrial refraction, the extreme difference between any two of the observations does not amount to 250 feet. The Kylas Peaks, besides several others, were calculated from many stations at various distances, and none of them differ above 500 feet from one another. The next highest peak to the Tuzheegung is above 21,000 feet, it was seen from Hutoo fifty-three miles distant under an angle of  $1^{\circ} 47'$ , and its altitude deduced from this comes within 200 feet of what the observation at Rogee gives it, where the distance was eight miles, and the elevation about fifteen degrees.

The altitudes of our stations were calculated by M. Ramond's method above Soobathoo, where the barometer was observed five or six times a day during most part of our absence, and the height of the column was invariably measured from the surface of the mercury. By the mean of a whole year's barometrical observations, Soobathoo was found to be 4,205 feet above the level of the sea.

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*Memoranda on the Geology of Bundelcund and Jubbulpore.* By DR. J.  
ADAM, B. M. S.,

The following paper has been found amongst some old records, and it has been thought that its contents well entitle it to be rescued from oblivion. I am happy also to add that the collection to which it refers is now safely placed beyond risk of loss in the Society's cabinets. Being No. IV. of our Geological Catalogues.



The observations I have now the honour to lay before the Society, were originally intended to accompany a series of geological specimens, for the purpose of illustrating their relative positions and localities, or (according to the technical phraseology of the day) their *geognostic* and *geographic* situations, without a knowledge of which, no collection can be of much value. At the time, however, of dispatching these, I was still prosecuting a long march in a remote part of the country, and could not then command leisure sufficient to enable me to throw together the detached memoranda I had committed to paper in the early part of the route. Other circumstances afterwards interfered to prevent my putting this intention into execution, and it is only lately that I have been reminded of it, by finding in the Museum below, the collection to which the notes refer.

While, with all deference, I solicit the attention of my fellow members to the subject of the following pages, I must at the same time crave their indulgence for the imperfections in the manner of treating it, necessarily arising out of the scantiness of my materials. In moving along, from day to day without intermission, I could only take a very hasty survey of the geological features of the districts through which I passed, and was often thereby precluded from obtaining all the information desired. I trust also, they will make allowance for the want of interest inherent in such details. The objects of geology present little to allure a general enquirer; and indeed taken singly, may be said to be the least attractive that can engage the attention of mankind. A bare rock, or a clod of earth offers in itself nothing interesting. But when viewed in combination with surrounding objects, when contemplated in its relation to these, its local site duly considered—and the influence which it may exert in the mass on the animal and vegetable world; it then assumes a higher degree of importance, and the study will

be found not only a pleasing one, but a source of great public utility. Observation pointing out the path, the geologist ascends from facts to inferences, gradually but surely ; and though the way may be said to be long and wearisome, he obtains at length, in the great truths which it leads to, an ample recompense for all his toils. To trace the changes on the ever-varying surface of this globe ; to compare the present with the past, and thus to study the history of its inhabitants in their several epochs of existence, from the shrub and insect up to man, the proud lord of all, constitutes the paramount aim of this research ; while the discovery of new minerals, or their compounds, and new applications of them to the arts of life, stamp on his labours an additional value that they would not otherwise possess.

To qualifications leading to any such results, I have not the smallest pretensions, nor dare I aspire to the title of geologist from merely noting down a few simple facts and deducing the most obvious conclusions from them. Should the detail, however, prove the means of exciting those to prosecute the study of Indian geology, who possess greater ability and opportunities, I shall feel that my time has not been wholly misemployed. I need urge no stronger plea than this expectation for again bringing before the Society a collection apparently so little worthy their notice.

These specimens comprise all the rocks met with, between the Jumna and the Nurbudda, by the route of Banda, Lohargong, Bellary and Jubbulpore. They commence with the hills in Bundelcund, after crossing the Jumna at Chilly-terrah Ghaut. Between the hills and the river is situate a plain of considerable extent, the aspect of which differs so widely from that of the opposite country in the Dooab, as to merit particular notice. It may be observed, generally, that the soil of the plains of Hindostan *intra Gangem*, is a light coloured mould, consisting of a due proportion of argillaceous, siliceous, and calcareous earths, the last being most abundant above Monghyr. Its chief character is derived from the quantity of mica which it contains in minute grains and scales. This also prevails in the district I passed through from Allahabad to the Ghaut on the Jumna. About half a mile from this river we descend a bank, which at one time may have formed its boundary in the rainy season, and enter upon a low flat, where in place of a fair, shining, attenuated mould, the eye meets nothing but an uniformly

dull coarse black earth, not unlike the half-digested soil of moss-lands at home. This dark soil is still more striking on the Bundelcund side, and continues almost the whole way to Besseramunge. It seems to contain a larger proportion of argillaceous earth and vegetable recement, than the lands on the left bank of the Jumna, and that generally observed in the Upper Provinces of India.

The Jumna, where the passage is made, is a smooth gently flowing stream. The banks shew no rock, but are high and perpendicular, and when viewed from the opposite shore along with the Kane, (which here joins its waters to the Jumna,) they look rather interesting, and are devoid of the dullness which characterizes the banks of the united rivers below Allahabad.

On approaching the town of Banda, distant two marches or about twenty miles from the river, several small hills are seen in the West, like erections for flagstaffs posted at regular intervals. They are of a conical, or rather pyramidal figure, and appear to run in one line from N. W. to S. E. One of these rises from the plain close to Banda. It is about three or four hundred feet high, and divided at the upper part into two or more smaller elevations, of which the central alone terminates with a pointed summit. The appearance of this hill from below is singular and fantastic; huge masses of stone presenting themselves in every position, and seeming quite unconnected the one with the other, while the few shrubs growing out from between them, serve as a contrast to the nakedness of the rock. On ascending the hill, we find this to be a reddish small-grained granite, having no regular arrangement, but lying in blocks of great size, some perpendicular, and others horizontal, with a convex or rounded surface in general. Many of these are scaling off; but the greater part remain perfectly entire, and possess more compactness of *integral* structure than any rocks of the kind I have met with.

This hill at Banda may be considered to be the termination of the first of many series which traverse Bundelcund from W. to E., as no more are observed here. Following that line, soon after leaving Banda to the South, other hills come into view, and at first sight appear larger than the one at that place. This is chiefly owing to the effect of distance, increased by the dewy air of the morning; for on a near approach, we find these not to exceed the congeries at Banda, or the

highest does so only on a small degree. Though evidently entering upon a mountainous country here, we are surprized to observe no general elevation of the surface; the same flatness of the plains continuing as on the opposite side of the Jumna, and the hills rising abruptly from a common level, like so many islands rearing themselves out of the ocean. They are, in fact, mere pictures on *dry* land of the rocky Madeira, Porto Santo or the Canaries, as seen in the voyage from England to India. At the village of Gerawah, twelve miles from Banda, we reached the second series. The general figure of these hills like the former mentioned is pyramidal, and they may be said in this respect, to resemble a fragment of the granite which composes them. They stretch from the village of Gerawah\* in two or three directions, the line of some crossing that of others, and notwithstanding their irregularity as a range, they appear to follow individually particular series, and we can trace a succession of isolated rocky elevations, forming a sort of chain across the country. The largest of these situate to the right of the village, has at its summit a rock of a white colour like chalk, which I regretted the distance prevented me from examining. The others are composed entirely of granite similar to the rock at Banda, and present in general, the same deficiency of arrangement. There is, however, one apparent exception at the highest part of the hill immediately overlooking the village; *there* the piles have assumed the appearance of basaltic columns standing perpendicularly with four sides, and at a small distance, seem to be a superincumbent stratum of a different formation from the others underneath. On approaching as near as I could, I found the rock essentially the same however, but was at a loss to account for this peculiarity in its outward form. As I moved along the projecting blocks and ledges of this hill, I was particularly struck with the extreme heat which they retained. Although the sun had gone down some time on the opposite side, this was still so great as to be barely tolerable to the hand, and the atmosphere over them was proportionately elevated in its temperature.\*

The country around here displays a thousand charms, compared with the district near the Jumna. The roads are dry, and the rocky elevation in front having a covering of beautiful shrubs entwined with every variety of climbing plant, which give quite a new feeling to the mind on

\* Sp. No. 1 to 3.

viewing the prospect. New animals too, inhabitants of these, present themselves. The peacock arrayed in all Iris' gorgeous hues, and shining in his native plumage, is not unfrequently seen perched on a block of granite, while herds of antelopes bound along the plain below, and the shrill cry of the Indian partridge heard on every hand, first cheers the traveller with the opening day.

At Pungrawah,\* the second stage from Banda, we find the rocks on every respect similar to those described. In the march from Pungrawah to Kurtal, the next village on the route, a range of hills is seen in front, and on the left hand, much higher than any previously met with, and which, in place of the peaked summits, are crowned with a flat *table-land*. On one of the most conspicuous of those to the left stands the celebrated fort of Callinger. On reaching Kurtal, we still find peaked hills composed of granite, having the same characters as that at Bandah, Gerawah, and Pungrawah : and besides this, masses of a bluish coloured trap and large boulders scaling off in concentric layers. This trap rock appears to have been at one time extensive ; and I could trace a superficial stratum over the granite for some way up the hill. What remains of it rests on that rock, without any distinct arrangement. The whole seems much affected by the operation of the elements, and it is probable, that from this cause a large formation has been removed and reduced to soil. Many of the granite blocks here are also fast going into decay, and the soil of the district adjoining is entirely formed from them. Its colour is sandy red, that of the felspar, and in this red sand, as a basis, are contained a great many small quartz crystals, which still remain entire, and unaltered in their structure. Chalcedonic pebbles are also found at the bottom of the hills at Kurtal, which appear to have been imbedded in a rock that had likewise rested at a former period over the granite. They possess the same characters as the pebbles found in the river Kane, that are so much admired on account of their beautiful variegated appearance and lustre when cut.

After leaving Kurtal, the road strikes into a wood of low trees, flanked on both sides by hills with flat summits ; and for the first time we observe pieces of sandstone strewing the path, mixed with broken blocks of granite, and the more complete detritus forming the soil. On one hill, which is nearer than the others, we can distinctly see a horizontal position of the superior strata ; and under the table face, a

\* Sp. No. 4 to 8.

sort of projection enlarging the diameter of the hill, and gradually increasing to the base. The upper formation is evidently of the same nature as the detached pieces of sandstone found at the surface, while the great body of the hill is composed of granite, (and also perhaps trap,) similar to that of the pyramidal hills formerly described. Some *fuqueers*, or religious devotees, have taken up their abode on this hill, at the junction of the sandstone with the granite formation, and the face of their caves cut out of the solid rock, and *chunamed* over, with the elevated platform on which are placed the objects of their idolatrous worship, present altogether a very striking and conspicuous appearance from the plain below.

On passing the *fukeer's* hill, we came in sight of the eastern extremity of Adjeeghurh.\* This fort like Callinger, crowns the summit of an isolated hill, and derives its principal strength from a *table-face* of sandstone rock. The sides of the elevation are covered with thick jungle, composed of beautiful low trees of every shade of green in their leaves, and of every size and shape, from the pinnated peaked leaflet of the tamarind to the broad expanded foliage of the teak, which, according to my knowledge of Indian dendrology, is very abundant in all these hills.

As far as my limited observation enabled me to determine, granite forms the great body of Adjeeghurh, and sandstone lies over it at the upper part, presenting all round a perpendicular face of rock to the height of between thirty and fifty feet, and constituting a natural barrier of defence, that of itself seems to render the place impregnable. The sandstone has a slight reddish tint, and is of the formation termed the old red sandstone. Its position is perfectly horizontal, and its structure in general quite sound. The view from the ramparts of the fort displays well the peculiarity I remarked before, respecting the want of general elevation in the whole of this mountainous tract. Hills are seen in every direction covered with jungle, and rising abruptly out of an intervening flat country, the dull and cheerless aspect of which conveys to the mind the idea of an uninhabited waste, or the haunt of savage beasts only. It is precisely the expression Daniel has given in his delineation of a fort in the Mysore, where a sort of sombre stillness reigns, (if I may be allowed so to term it) that no language can pourtray. Adjeeghur and Callinger are no less

\* Sp. No. 9 and 10.

interesting to the antiquary and mythological enquirer, than to the geologist; and the lover of arts will find abundant subject of admiration in the beautiful remains of ancient Hindoo architecture which still exist within the walls of both these forts.

The country for a short distance from Adjeeghur is open, and the soil which hitherto had partaken of the qualities of the prevailing rock, again resembles that on the other side of Banda. It is of a dark colour and soft, what by agriculturists at home would be termed *rotten soil*, the "*putre soliem*" of the Poet.

"Nigra fere, et presso, pinguis, sub vomere terra"

"Et cui *putre soliem*—————"

"Optima frumentis; non ullo exæquore cernes,"

"Plura domum tradis, decedere plaustra juvencis."

A few miles further on, we came to the village or hamlet of Besseramgunge, beautifully situated at the foot of a wooded hill over which are the Ghaut passes to the upper district. This Ghaut leads from the low country of Bundelcund to the elevated table-land on a level with the hills last mentioned. The path is cut through, or carried over granite, trap, and sandstone. At first the ascent, though pretty steep, is not difficult; as there are few large stones, and no rock rising from the surface. Soon, however, it becomes steeper and more obstructed; granite, trap, and sandstone masses presenting themselves in succession, and in many of the last, may be perceived *quartz* nodules included, like those found in the sandstone of Table Mountain at the Cape. The arrangement of the sandstone is in general horizontal, but at some points it appears to rise from the surface, in the form of ridges almost vertical. The trap rock exhibits no well defined arrangement at the several points where it is found in the Ghaut; and I could not penetrate into the jungle here to examine the strata more extensively. It may, however, be inferred, that it is in every respect similar to that rock at Callinger, which I afterwards found lying chiefly in rounded masses of various sizes, occupying the middle of the elevation, and composing the greater part of it. These were in general mouldering at the surface, and many of the smaller boulders could be reduced to powder without the assistance of the hammer. The larger masses were more compact, and possessed great hardness. This rock belongs to the transition trap of Werner, to



which class may also be referred that formerly met with at Kurtal, lying immediately over the granite of the peaked hills. The elevation may be altogether from 1,000 to 1,200 feet above the plain of the Jumna.

On reaching the top of the Ghaut, we cross one or two clear running streams, and some oozing rills and pools of stagnant water are met with, most of which indicate, by their blue slimy and iridescent surface, an impregnation of iron in the adjoining soil. This is indeed composed of ferruginous gravel and reduced sandstone, and if we may judge from the luxuriant grass growing over it, it must be one of considerable fertility. The town of Punnah is distant about eight miles from the Ghaut, and the whole of the surrounding country here derives an additional interest from its being the source of the diamond. In my march thither, I passed several of the mines close to the road, but having resolved to halt a day at the town, I deferred my examination of them till the following morning.

Having started early next day, I soon reached the scene of operations, distant about three miles to the westward of the town, and in a situation corresponding to that on the other side. It was a thin jungle, with long delicate grass growing out of a reddish soil. The mines are mere narrow pits, four, five, or more feet deep, according to the distance of the subjacent rock from the surface, and dug out of a ferruginous gravelly soil, of a dark brown or blackish colour, like hepatic cinnabar.\* It feels moist, and consists of fine sand, with a large proportion of small dark red and whitish, or *yellowish-white* pebbles, the former appearing to contain a large quantity of iron. When I arrived at the ground, two men were engaged in searching for the precious mineral, the chief of whom very readily replied to all my questions, and explained and exemplified the series of operations gone through. These are extremely simple. The soil,† as it is brought from the neighbouring pit, is thrown into a small square excavation in the ground, about two or three feet deep, the sides of which have been well beaten to prevent the gravel from adhering to them; a quantity of water being added, a man steps into the place with a small hoe and mixes the whole together, using his hands also for that purpose, and tossing away all the larger pebbles. This movement being continued for some time, the water is then thrown out by means of a small wicker

\* Sp. No. 11.    † Sp. No. 12.

basket, and carries with it the sand, leaving the gravel behind. After repeated application and discharges of water, the gravel is removed into another small basin of a circular figure, where it receives the last washing. From these it is conveyed to a large floor on the surface of the ground made of hardened earth, and there left to dry ; the finishing operation consisting merely in a minute examination of this dry gravel, by a person acquainted with the external characters of the jewel in its rough state. Judging from the condition of the people employed, one would hardly believe that they could be able to detect a stone, but they assured me, they did so with the greatest ease, and it appears to be the transparency and lustre, even in this state, which directs them. The chief man picked out several pieces of transparent quartz from the gravels which he said resemble the diamond, " he had found them of " all colours and sizes, but the discovering of these, he added, did not " depend upon his own skill or exertions, it was altogether the " work of God,"—salaaming at the same time respectfully ; and pointing with a most expressive manner to the heavens.

From the inquiries I made, diamond mining appears by no means a profitable concern at Punnah. Any one may dig, subject to paying the common duty of a fourth part of the produce to the Rajah, who is here, (as is the case every where else in Hindostan,) paramount lord of the soil. All stones, however, beyond a certain carat, are exclusively claimed by him ; but it may be supposed, where the means of concealment are so much in the power of the workman, that the prince's treasury very seldom benefits by this source of revenue. In the farm or spot which I examined, two diamonds only had been found during the preceding year, and these fetched each 200 rupees. The number of workmen commonly employed, (in the various operations of digging, carrying, washing, and searching,) is from four to five, though I saw only two. Of these, the *sirdar* or chief, has a salary of five rupees per month, and the others have four, and when a valuable stone is found, some present proportioned to that, is generally made them by their master. So that after paying the duty and expence of working, it is obvious his gains in this instance must have been very small and not sufficient to induce him to persevere much longer in these operations. Indeed, the business of mining appeared altogether at a stand when I passed the spot ; and judging from the remains of pits in every direc-

tion, it must have been carried much more extensively in former years than at present.

Red ferruginous gravel, the *matrix* of the diamond, may be considered as terminating the regular formations of the hills in this part of Bundelcund, the order from below being granite, trap, or basalt sandstone and gravel.

In taking a comprehensive view of these four formations as developed at the different sites mentioned, whether singly or in combination, we must at the same time consider the qualities of the soil in the intermediate and adjoining districts derived from them.

The prevailing soil in Bundelcund, and indeed all the way between the rivers Jumna and Nerbudda, is the black coarse earth already alluded to, consisting apparently of a larger proportion of clay and carbonized vegetable remains than is found in the lands to the north of the former stream. It retains moisture more perfectly than the common soil of Hindostan, hence its miriness in the rainy season, and its disposition to unite into masses, and form rifts and cracks during the dry and hot weather. Even in its driest state, however, it has not the stony compactness of pure clay soils, but when separated in small pieces from the mass, is found to be friable and easily reduced to powder. I think it probable, that this contains a proportion of magnesian earth, though never having subjected it to chemical analysis, I am not warranted in drawing this inference from any accurate data. It is reckoned exceedingly fertile, and the richness of the Bundelcund lands, where this soil predominates, is quite proverbial in India. From its quality of retaining moisture, the process of irrigation is not so frequently resorted to, and the labour of the husbandman becomes thereby lessened. Greater exertions, however, are necessary for preparing it for the seed, and in keeping it clear of weeds, than we see applied to the lands in Hindostan generally. A long grass, not unlike some of the troublesome varieties at home, was then springing up every where, at the time I passed through the district, and formed the only obstacle to the ploughing then going on in all directions.

One would imagine that the above characters of the soil would affect the atmosphere, and render the climate of Bundelcund moist and unhealthy. As far as my own observation extends, agues are very prevalent in the whole of the low country, and sometimes prove so

severe in European habits, as to require a change of air for their removal, but the native population do not seem to suffer from any endemial diseases of this class in a greater degree than the inhabitants of other parts of India; and their appearance upon the whole, as presented to myself, was rather prepossessing, and indicated general good health and comfort.

This black soil has evidently been derived from the decomposition of some of the many varieties of trap rock, most probably amygdaloid or green earth, which appear to have rested at one time over the granite in the hills of Bundelcund. The trap rocks at Gerawah and Besseramgunge, and the globular variety observed on the hill of Callinger, may also have had a share in forming it. As I remarked before, many of the trap boulders are now in a soft state bordering on earth, and can be reduced to powder with the greatest ease. The soil immediately around, there can be no doubt, is formed from their *debris*, and as the plain in general resembles that, we may reasonably infer, that it also acknowledges a similar source.

Extensive forest, which it is not difficult to conceive had flourished here at no very distant period, may have furnished the vegetable matter; and the successive increase of a heavy moist soil covering the wood with each return of the rainy months, had prevented its complete decay. For the amelioration and improvement of such a soil in Europe, the agriculturist would have recourse to lime, as rendering it drier, and reducing the vegetable matter it contains to a state more fitted for supplying the requisite nourishment to the growing plant.

In India, however, such an expedient would not be attended with success, from the peculiarity which calcareous earth displays here of uniting into small masses, termed kunkur, and not mingling well with the other component parts of the soil, unless where siliceous sand happens to exist in an unusually large proportion. A mixture of this sand, either derived from sandstone rock or the *debris* of granite, and similar compound rocks, might be attended with the desired effect. We should certainly expect a favorable result from reasoning on the subject, but I am the more induced to think so from actual observation of another part of the same district, between Cullinger and Allahabad via Turrowa. There, a considerable change is indicated in the colour and properties of the soil. It becomes lighter as we proceed, and more attenu-

ated ; and seems to have been formed by the commingling of the alluvial deposit of the Jumna, with the black earth of the plain. Its fertility, if I may judge from the richness of the crops at the time I saw them, must be very great. The whole country towards the river presented one aspect of bountiful nature, and might well vie with the poet's "Gargara," in the ease with which it is cultivated, and the ample produce it yields the husbandman in return.

The appearance of the first hills in Bundelcund has been already described. It is quite characteristic of the granitic or purely primitive formation. Their outline, contrasted with the table-face and summit of those in the interior, exemplifies in a striking manner the effect of rock on the figure of mountains in general, from which we can often determine at the distance of many miles, the nature and position of strata forming extensive ranges. Hence too, we perceive the connection between geology and painting, and the advantages to be derived to the artist from an acquaintance with the elements of this science. The tops of the Himalya mountains, as represented on the splendid views of Mr. Fraser, may be inferred *a priori* to consist of granite from the mere circumstance of their form. They exhibit precisely the same outline, "*magna componere parvis*," as the isolated primitive hills in Bundelcund, but having their cliffs so softened by distance, as to present a uniform line at the various angles visible.

As to the manner in which the primitive hills in Bundelcund have been formed, it might seem presumptuous in me to hazard an opinion ; the question involving in some measure the two grand theories of Hutton and Werner, that have so long divided the geological world. Yet it is impossible to contemplate the eminences at the same time with the ranges in advance, and not form some conclusion on the subject.

They appear to exhibit the *cores* of large hills, the exterior of which has suffered in the lapse of time ; their more compact granitic interior still enabling it to resist the natural causes of decay. I think it most probable, that the whole of the district from which they rise, had at one time presented an uniform flat consistency of the three formations of granite, trap, and sandstone, in the same order as they are now found on the hills, and that some force from below had elevated the primitive rocks, causing also a disruption of the secondary strata.

Where this force was but slightly impressed, and on a limited area, a

small elevation would be formed. The granite would then only break through the superincumbent strata, without carrying any part of them along with it, while the broken strata would rest on the sides of the mass after the impelling force ceased to act. The figure of the hill, then, would not be a pyramid which it now resembles, but would approach more to that of a core; sandstone, trap, &c. lying on, and surrounding the granite and filling up its inequalities, and the direction of the strata of each of these deviating, more or less, from the horizontal line in proportion to the elevation of the central mass.

We could thus picture to ourselves a hill more extensive than any of those now existing in the first series, the sides of which were composed of sandstone ledges, and the summit of a pointed block first, or mass of granite, or crowning the whole, may have been a table of comparatively small dimensions. Their original height in this case, may have been from thirty to fifty feet greater than their present, that being the average of the sandstone strata on the hills in advance. The process of reduction or diminution of bulk may be conceived to have taken place in the following manner. The sloping sandstone being acted upon by the elements of air and water, joined to the heat of the sun, had first undergone disintegration. The sand thus produced, would be washed down by the torrents in the rains to the base of the hill, and there spread out and form soil. This operation being continued, in course of time the whole of the inclined sandstone would be removed, and the trap or other rock immediately beneath it, come to be exposed in its turn. From the same cause which acted on the sandstone, this would also undergo a change, and ultimately be reduced to soil, covering the *detritus* of the former as it was deposited. The small table on the summit, in the course of these operations falling into fragments and rolling down the hill, would be exposed to the same successive changes as the sloping strata, and thus after the lapse of ages, nothing remain but the central primitive granitic mass as it is now displayed, forming, to use an anatomical illustration, the skeleton of a body which once existed. Both the ranges then, (the peaked, or primitive hills, and the tabular,) have been produced by similar causes, and at one time have been composed of similar materials, the only difference arising from the size, of the primitive or granitic base. The sandstone so often mentioned, and the ferruginous gravel lying over it, are of very fre-

quent occurrence in what are termed the Vindhya chain of mountains, from the centre of Behar to Malwa. The hill of Chunar consists entirely of the former, and in the range to the south of that station, the gravel is met with, as I have been informed, in great abundance.

The same association is observed in Bundelcund, and all the way to the Nerbudda; so that it may be inferred from this connection subsisting between them, as well as their coincidence in chemical properties, that the one is formed from the other. In what manner the chalybeate impregnation has taken place is not very evident, nor the source from whence the metal has been derived; but there can be little doubt the gravel is a secondary formation of the sandstone rock, and one too in all probability going on in many situations at the present day. It is interesting, as being the *matrix* of the diamond, both in the old and new world, and much speculation is necessarily connected with it on that account. It would, however, be foreign to the object of this communication to inquire into any opinions not obviously suggested by the facts detailed, and nothing occurred to me at the time I examined the gravel formation at Punnah and elsewhere, that promised to elucidate the origin of this highly prized jewel.

In proceeding southward from Punnah, we very soon approach another series of small hills, or cliffs, that rise out of the table-land to the height of one hundred feet or upwards. These elevations are also flat at the top, and composed entirely of sandstone, in every respect similar to the strata at Adjeeghurh and on the Ghaut, of which indeed they are but a part. For eight or ten miles the road here ascends occasionally, and we seem to cross over a low ridge connecting the hills to the right and left. The soil in the whole of this course is formed from the debris of the sandstone rock. It is of a light red colour and very dry, imparting rather a pleasing character to the aspect of the country, as well from its own sensible qualities as the vegetable productions it affords.

It appears admirably fitted for the culture of the vine; and should this ever be attempted on a great scale in India, perhaps no better situation could be selected for the purpose, than at the bottom of these sandstone hills in Bundelcund. Near the village of Cuckurettee,\* a slight descent occurs; and we again enter upon an extensive plain, whose soil resembles, in some degree, that of the country below the

\* Sp. 13 to 15.

Ghaut. Here for the first time, traces of *limestone* are discernible. These increase as we advance, and bring us at length to the great calcareous formation, at the military cantonment of Lohargong.\* The first intimation I had of this new field of geological research, was the discovering several species of shells on the banks of a nullah at Cuckurette, from which I inferred the near vicinity of calcareous rock; as it has been observed by naturalists, that the Testaceæ are only met with in soils abounding in this elementary earth. Between Cuckurette and Lohargong, pieces of rock are found at the surfaces, *striated* in an uncommon manner, and disposed into very thin layers. It appears to be a mixed formation of *sandstone* and *limestone*, the latter predominating; but whether it is extensive or not, I am unable to say, as the masses were quite solitary and detached, nor did I observe any projecting from below the surface.

At the cantonments of Lohargong the calcareous rock shews itself decidedly, and impresses a striking character on the country around.† It is quite near the surface, and in many places even forms it, having no earthy covering whatever. It is evidently a secondary formation, and as I afterwards ascertained, one of considerable extent. In a journey which I made from Saugor, I could perceive indications of it six or seven miles to the westward, and in the other direction it is found in combination with clay schists, as far the bottom of the Kopah hills,‡ distant twelve miles from Lohargong. This rock is not distantly stratified, (as far as it was possible for me to observe,) but lies on the same general level with the plain, having its denuded surface convex or slightly rounded off. It possesses great compactness, and exhibits no signs of disintegration. On the contrary, exposure appears to harden it, by communicating to the bare surface a sort of semi-crystalline, or *stalagmitic* crust.

From this arises I conceive the bleakness, and inhospitable character that pervades the district, the ground being little cultivated, and bearing only a *reed-like* grass. By reducing the lime to the quick state, and mixing it with the neighbouring soils, some improvement might probably be effected; and at all events, as far as a horticultural experiment may afford evidence, it seems worthy of trial by the residents on the

\* Sp. 13 to 15.

† Sp. No. 15.

‡ No. 16 and 17.



spot. This calcareous rock is of a formation posterior to the sandstone, and it is not improbable, rests upon the latter.

Casting our eye over the plain here, and surveying the hills that rise on each side, in a manner surrounding and enclosing it, we naturally conceive the idea of an immense basin that had at one time been filled with water, and formed an extensive lake. Some river, we may suppose, had burst through the hills to the south, and diffused its waters over the plain. These, as they gradually accumulated, would at length equal the level of the range on the northern side, and force a passage to the country below.

We should thus have a lake, like that of Geneva, with a river entering at one side, and passing out at the other. In process of time, the lake filling up by the deposit of alluvium and animal recrement, a contracted channel only would be left for the stream to flow in ; while the earthy contents of the basin would gradually acquire the form and solidity which they now possess. What the mere aspect of the country suggests, may be said to receive some degree of confirmation from the circumstance of the Kane actually following the course here described. It issues from the hills to the south of the plain, and descends over the rocky barrier on the opposite side, hollowing out a channel in the stone as it proceeds, and shaping it into every variety of fantastic form. These *falls* of the Kane, as they are called, are situate a few miles off the direct route from Lohargong to Saugor, and distant about two marches from the former. They are well worthy the notice of the passing stranger, on account of the singular forms presented by the rock which receives the river, and conceals its course for many miles ; the bed of the stream above the falls also abounds with beautifully variegated pebbles which admit of a high polish, and are much sought after for ornamental purposes.

The pure calcareous formation at Lohargong, succeeded by a scissile rock, is apparently consisting of argillaceous sand, mica and lime, and may be termed a *sandstone slate*. It divides with great facility into thin laminæ, and has a regular horizontal stratification, as is well displayed at the ford of the Kane near Kopah, where both banks of the river are composed of it. The only effect I observed this rock to have on the soil, was to render it less pervious to moisture ; and thereby to cause the water to stagnate on the surface in the form of marshes and

shallow pools, which were more general here than in the preceding district.

After fording the Kane, here about hundred feet wide, we reach the village of Kopah, and enter directly on the range of hills forming the southern enclosure to the Lohargong basin. These are of various heights, but though less striking in their aspect than the range of the opposite side, they often afford the most beautiful and romantic prospects. They are entirely composed of sandstone of the same general characters as that so often alluded to. I picked up some specimens with dendritic impressions on the surface,\* and occasionally found a mass of a different shade of red marked with white dots,† but these varieties seemed to be quite accidental. The strata were horizontally disposed, with the exception of one or two points, where they shewed considerable dip. Many ferruginous pebbles are met with, which appear to contain a larger proportion of iron than the gravel at Punnah. They are of the same essential characters, however, and only differ in that particular in being rather larger. On the hill immediately above Bellary, they are found united together in great masses, exceedingly compact, and apparently quite indestructible by the operation of the elements. From Kopah to Bisseinee is a distance of eighteen miles; from Bisseinee to Jyenuggur ten or twelve; and from this last place to Bellary as much more. The whole of this tract is hilly, and presents nearly the same general features throughout. We cross many clear running streams with rocky beds, ascend and descend moderate elevations, and between these, occasionally pass over a grassy plain. Around Jyenuggur the country is cultivated, and a patch of corn may now and then be met with in the early part of the route from Kopah, but with these exceptions, it is a continued jungle all the way to Bellary. On descending to this plain, the country again opens to the view, and a large plain with trees scattered thinly over it is seen extending in all directions. Having travelled by night from Bellary to the next stage, Koreah, I could not observe the appearance of the intermediate country, which was nearly as flat as the low country in Bundelcund. Between Koreah and the town of Sehorra, we find a new formation altogether, consisting principally of quartz. Some of the rocks are

\* No. 18.

† No. 19.

pure quartz, and disposed in vertical strata. Others have a peculiar striped arrangements in the mass, and in colour, lustre, and compactness, are not unlike the limestone of Lohargong. On arriving at Sehorra, I found these two rocks composing a small hill on which the fort or *gurree* is built. They appear to be primitive blue slate and quartz lying in opposition,\* and in almost vertical and very thin strata, each layer not exceeding four inches in breadth. In several of the schistose strata, the stone has metallic lustre, and may with ease be reduced to powder. The quartz shews nothing peculiar; it lies close on the slate in continuous strata, and veins or thin laminæ may be observed intermingling with schistus. It bears, however, but a small proportion to this rock. In some specimens, the slate is striped with variously coloured materials differing in hardness. The town or village of Sehorra, where these rocks are met with, is prettily situated on two or three small gradually rising eminences, having a good deal of open grass glade, terminated by mango groves, in such a manner as to give to the whole the air of an English scene. The soil of the district around is of the same black colour as that of Bundelcund, but more clayey. It is extremely fertile, and the appearance of the surface at the time I passed, indicated that great care was bestowed on it by the ryots. For miles to the south and west, not a spot could be perceived which was not cultivated, and laid out in square pieces, with an intervening low mud dyke, similar to the paddy fields of Bengal. Rice too appeared to be a common crop here.

A few miles from Sehorra, we cross the Hirn, a stream of considerable width which falls into the Nerbudda, a little to the westward. The bed is not rocky like the Kane at Kopah, but formed entirely of sand without any gravel or pebbles. At a sweet little village named Gosulpore, which rises out of the surrounding miry soil, like an *oasis* from the desert, we again meet with large masses of the ferruginous concrete.† It is here more decomposed than on the hill above Bellary, and the ground on which the village stands, has evidently been formed from its *debris*. The natives, I was told, reduce the rock to the metallic state, and in the neighbouring town of Punnahghur work it very extensively; but not being aware of

\* Sp. 20.

† Sp. 22, 23.

this at the time of passing through the place, I could not make any enquiry as to the mode of accomplishing the reduction. I should reckon it of very difficult fusibility, with all the assistance which art can bestow. In the dark clay soil around Punnahghur is interspersed a good deal of the well-known calcareous concretion, termed *kunkar* by the natives. It does not seem to be so pure as that found on the banks of the Ganges, but contains a greater mixture of argillaceous earth. All these combinations of lime with the other elementary earths, are of a secondary formation, and are continually going on in such soils as abound in the former. It is not easy to say, how the process of union takes place, but it would appear to be dependent on the alternate action of the sun's rays and moisture, and to resemble very closely chemical, or electric attraction, as influenced by similar means. We meet with nothing like this calcareous concretion in the soils of Great Britain, as far as I am aware of, and whatever the cause may be which produces it, we may reasonably conclude, that its operation is limited to the hotter regions of the globe.

Between Punnahghur and Jubbulpore, we cross a small river named the Periot or Praca, (as laid down by Arrowsmith,) the bed of which abounds in every variety of agate and siliceous pebbles.

Near Jubbulpore is a low ridge of granite rocks,\* in general qualities resembling that of Bundelcund, but approaching more to the gneiss formation, and at present undergoing a rapid decay. The whole district here is rocky, and presents a fine field to the geological enquirer; but my short stay only permitted me to give a cursory glance around the cantonment. Directly to the south of these, there is a formation of *old red sandstone* that appears to have been extensively quarried, and exhibits the peculiarity of being arranged in vertical strata, contrary to the usual position of this rock. A large mass of a whitish clay rock, containing quartz pebbles, forms the base of the hills to the east of the plain. It has been washed down by rains to powder, and formed anew into a boulder or cake at the surface. It probably has been formed originally from the disintegrated felspar of the neighbouring primitive rocks. The ridge lying over it, to the north and east, presents the primitive outline, and I concluded, was composed of similar granitic blocks to those

\* Sp. 34, 35.

I had observed on approaching the town from Ramnughur. At Jubbulpore, we may be said to enter upon the extensive valley of the Nurbudda, the river being distant about four miles. It is a clear mountain stream with a rocky bottom, in width here not much exceeding the Kane, but greatly deeper at the time I crossed it in the month of October.

The rock of Tetwarra Ghaut, judging from detached pieces, seems to be a species of trap, and lower down the river, I was informed, passes over a formation of primitive limestone. Some blocks of this marble I have seen. It is of a pure white colour and close structure; and for all the purposes of the statuary might be reckoned not inferior to the celebrated Parian or Carrara. The natives, aware of its excellence as a material for sculpture, employ it in making images of their gods, and various ornamental appendages to their temples.

*Report made by J. MOHL, in the General Meeting of the Asiatic Society of Paris, 31st May, 1841, on the labours of the Committee during the six last months of 1840, and the six first months of 1841, translated from the French. By Dr. E. ROZE, Librarian to the Asiatic Society of Bengal.*

NOTE BY THE EDITOR.—The publication of the following article, in which allusion is made in much too flattering terms to myself, might be considered presumptuous, were not my readers apprised of the feeling with which I peruse this complimentary notice. It is a just acknowledgment of the talents, the industry, and research of my contributors, and it is in this character only that I lay it before them. This Journal is solely dependent for its name upon those who contribute to it, and it will be gratifying to them to find, that their support has not been unattended by the applause of men of the highest literary character in Europe, recorded in the proceedings of a Society, which ranks among the most eminent of the Western world.



Though the past year has not been marked in the annals of your Society by any peculiar event, yet it must be considered as a fortunate one, as it has afforded a slow, but constant increase of your resources, relations and labours, the most evident sign of the life, and most certain presage of the continuation of a Society. Your Journal has been regularly continued, and has been the store-house of numerous labours. The contribution of memoirs, received by your Committee of the Journal,

has been greater than usual, so that it will soon become necessary to increase the size of your periodicals, to meet the activity of the members of the Society. We ought annually to have three volumes of the Journal, and one volume of the Collection of Memoirs, and though the resources of the Society do not admit our doing so at present, we may hope to attain this object hereafter.

The Committee would have desired to lay before you the first pages of the Voyage of Schulz, but could not command time. You will moreover observe, from the account which is to be given to you of the state of your finances, that the printing of this work, too long time already postponed, does not admit of any further delay. The great expences we defrayed for the printing of the Chronicle of Kashmir and the Geography of Abulfeda, are covered by the kind assistance of M. Villemain, Minister of Public Instruction, and the resources of the current year will allow us to send to the press the Voyage of Schulz.

The Society has sustained severe losses during the past year, especially among the foreign members. Mr. Gilchrist died on the 8th January at Paris. Born in Scotland in the year 1759, he passed a part of his early life in India, studied afterwards medicine, embarked as ship-surgeon to Bombay, entered there the service of the East India Company, and was transferred to Calcutta. He devoted to the study of the Hindostani, which he acquired with rare perfection, living for some years in a Mahomedan family. His systematic mind suggested to him the idea of forming that dialect into a language, which in Dehli and Lucknow had gained a great elegance as the language of conversation and poetry, but which in other parts of India, like the *Lingua Franca*, fluctuated between the Persian and the provincial dialects of the Hindus. He fixed the Hindostani Grammar, published a very good Dictionary, and translated a number of English works into that tongue, to furnish to its students works in prose, which were entirely wanting in the Hindostani literature, by which he rendered a signal service to the East India Company, giving a common language to their army, and the means of its successful study to their officers. Lord Wellesley made him Professor at the College of Fort William, where he had many pupils to attend upon his instructions. He afterwards retired to Edinburgh, where he established a bank, and some time later to London to

resume the teaching of the Hindostani, and he lastly repaired to France, where he was occupied to his death with his favourite theory of an universal language. He was rather distinguished for the activity than for the exactness of his mind, and for an ardent character, which threw him during his whole life into endless literary and political disputes, though he had a large fund of benevolence.

Another very distinguished member, the loss of whom the Society has to complain, is, Monseigneur J. L. Taberd, Bishop of Isauropolis, Apostolic Vicar of Cochin-China. Born at Saint Etienne in the year 1795, he took orders in 1818, and went two years afterwards as Missionary to Cochin-China, where he arrived in the year 1821, just at the moment when the position of the French missions in that country became involved in difficulties. The Archbishop of Adran, who in Cochin-China had exercised an almost royal power, expired, when the reaction on which the Anti-French and Anti-Christian party a long time since contemplated, forthwith broke out, and thence continued to rage with increasing fury until this day. Under these difficult circumstances, M. Taberd was elected in 1823, Superior of the Mission, and in 1827, Bishop of Isauropolis, and Apostolic Vicar of Cochin-China. The persecution having dispersed the Bishops of Cochin-China, he was obliged to remove to Siam to be consecrated. The king Ming-Menh, however, by fixing a price during his absence on his head, prevented him from re-entering his diocese. Then taking refuge to Pulo-Penang, he founded the Catholic College for the missions of Transgangetic India, and went from thence to Calcutta to print his Cochin-China Dictionary, the fruit of the accumulated labours of a large number of missionaries, which was completed by himself. The generosity of the Governor General of India, and of the Protestant Missionaries at Serampore furnished him the means of accomplishing his great undertaking. Some time afterwards, he was elected Apostolic Vicar of Bengal, but he could not discharge the functions of his new appointment, as he almost suddenly died on the 31st July 1841, and as he had not previously received his definitive nomination.

The year, the labours of which occupy us, has not been very favourable to Oriental studies, especially in Asia, where war has paralysed so many undertakings. These circumstances indeed will latterly turn out to the benefit of Oriental literature in Europe, because the more and

more increasing political importance of Asia must naturally claim the serious attention of the European nations ; but for the present, the literary progress in the small number of places where it has been developed, has been retarded. The presses of Constantinople, Teheran, Cairo and Canton, have produced nothing worthy of remark, and those of India, though not altogether unemployed, have been less active than formerly.

The Asiatic Societies have everywhere continued in their efforts to make known the discoveries in the languages and histories of the East. The Asiatic Journal commenced by the late Mr. J. Prinsep, is now edited by Mr. (Henry) Torrens, who conducts it with great zeal and ability. The Society of Madras continued its Journal with much regularity. The German Oriental Journal commences a new series, and the excellent Journal of the Geographic Society of London, becomes more and more a powerful ally to the collections, specially designed for the East. The number of these collections has been augmented by the *Orientalia*, published by Messrs. Juynbull, Roorda and Weijers. The first volume of these collections has appeared in Amsterdam ; its destination is to become the organ of the excellent school of Leyden, which displays in its Asiatic studies, the same spirit of learning and of conscientious research, which has for so long a time distinguished the classic Philology of Holland. The *Orientalia* do not exclude any department of research concerning Asia, but they are more especially destined for the Semitic languages and literature. The first volume contains a Posthumous Memoir on the collective Nouns of the Arabs by Hamaker, and a Poem not previously published, of Montanebbi, edited and translated by Juynbull, and a continuation of the Catalogue of the Oriental Manuscripts of the Library at Leyden, by M. Weijers. I should perhaps mention also as a new Asiatic Journal, the one published by the Society of Jesu in Lyon, under the title of "*Lettres du Madure*," of which six numbers have appeared.<sup>1</sup> It is composed of Letters of the Missionaries of this order in the South of India. Though its chief end is to give an account of the state of that mission, yet it contains a mass of details on the customs of the Hindoos, and would undoubtedly find its place in the libraries of the learned, if the Society were to allow the sale of it.

Two new Asiatic Societies have been established during the past year, one in Paris, "*La Société Orientale*," whose principal object is

1. *Lettres des nouvelles Missions du Madure*. Lyon, 1840, in 8vo. Vols. I. and II.



to publish the monuments of art of the Asiatic nations, the other in London, under the name of "Society for the Publication of Oriental Texts." It is now constituted and has commenced its labours. It forms the necessary complement to the Committee of Translations, and we sincerely hope, that it may be favoured with the support of the learned men and of public institutions ; which is so necessary for the execution of its great and difficult enterprise, as there is no chance of its becoming popular. It cannot be too often repeated, that the publication of the most important Oriental manuscripts is the greatest and most urgent want of our studies. Only when the critical labours of the learned have passed over the master-pieces of every literature ; when the press has facilitated the material use of books, and obviated the immense loss of time, occasioned by the reading of manuscripts ; when it has diffused to all corners of Europe the materials which must now be searched for in some collections of manuscripts, only then can European intelligence really penetrate the East, and by disengaging the historic truth from the thick layer of fables and contradictions involving it, reconstrue the history of mankind. The accomplishment of this object is indeed far distant, yet the way to attain it is distinctly pointed out, and every year we advance a step to it.

The number of catalogues of oriental manuscripts in the European libraries which are being published or prepared, may be considered as a very good idea for this purpose. The Bodleian Library at Oxford has a short time since finished the publication of its catalogue, fifty years ago commenced by Uri, and finished by Nicoll ; it has been published by Purey.<sup>2</sup> It is a great and beautiful enterprise, worthy of this celebrated library. Mr. Prinsep, a short time before his death, edited in two volumes, the Catalogue of the Manuscripts of the Asiatic Library of Calcutta. Mr. Fleischer, to whom we already owe the Catalogue of the Oriental Manuscripts at Dresden, has also published that of the Library at Leipzig.<sup>3</sup> Mr. Brooset has edited in Petersburg the Catalogue of the Armenian Library of Edchmiadzin.<sup>4</sup> For a long time it was the regret of

2. *Bibliothecæ Bodlianae Codicum Manuscriptorum Catalogin*, confecit Nicoll edidit Purey, in fol. Oxford, 1835.

3. *Catalogus Librorum Manuscriptorum Bibliothecæ Senatoriæ Lipsionis*, ed. Neumann. *Codices Orientalium Linguarum Descripserunt*; Fleischer et Delitib, 1838, in 4to.

4. *Catalogue de la Bibliothèque d'Edchmiadzin*, publié par M. Brooset. Saint Petersburg, 1840, 121 pages.

those who took an interest in the Armenian literature, that the treasures contained in the Library of the principal place of the Armenian hierarchy, were inaccessible to Europeans. At last the influence of M. de Flahn, Imperial Commissioner of the Caucasian provinces, has obtained from Catholicus the catalogue of his library, and the Academy of St. Petersburg hastened to communicate it to the public. We there may observe, that the disasters which during so many centuries oppressed the Armenian nation, equally retarded the progress of their literature; for the library of Edchmiadzin contains only 181 manuscripts, among which there are a hundred, which treat about history or geography, while the others are works on theology or scholastic philosophy. M. Schott has printed the catalogue of the Chinese books of the Library in Berlin, which is a continuation of the catalogue presented by M. Klaproth.<sup>5</sup> M. De Hammer edited the catalogue of his splendid collection of Arabian, Persian and Turkish manuscripts, and also that of the manuscripts of the Ambrosian Library.<sup>6</sup> M. Fluegel has likewise inserted in the annals of Vienna, a list of new acquisitions of Arabic manuscripts, which the Royal Library of Paris has made during the last years. The catalogue of the oriental manuscripts of Tubingen is published by M. Ewald,<sup>7</sup> and M. Dulaunier has inserted in your Journal the list of the Malayan manuscripts of the Asiatic Society of London. Lady Chambers has given to the press the catalogue of the magnificent collection of Sanscrit manuscripts, which her husband had made in India.<sup>8</sup> This catalogue is one of the last works of Rosen, whom death has so untimely taken from the prosecution of his oriental studies. The Academy of Lisbon has been sometime occupied with the preparation of a complete catalogue of all the oriental manuscripts in the Libraries of Portugal, which is of an incalculable value to literature, as the long dominion of the Portuguese in various parts of the East must have enabled them to collect a great many manuscripts. The Academy of Portugal will honour your Society with the charge of publishing the

5. Verzeichniss der Chinesischen und Mandschu, Tungusischen Bücher der Bibliothek in Berlin, von Ed. Schott, 1840, in 8vo.

6. In the Wiener Jahrbuchern, and separately printed in a small number of copies.

7. Verzeichniss der Orientalischen Handschriften der Bibliothek zu Tubingen, von Ewald, 1839, in 4to.

8. Catalogue of the Manuscripts of the late Sir R. Chambers, with a Memoir by Lady Chambers. London, 1838, in fol.

catalogue. The British Museum, a long time since one of the richest depôts of oriental manuscripts, is about to publish the catalogue of its Syrian manuscripts, prepared by the late Mr. Rosen, and we dare hope, that this excellent institution will make known the rest of its treasures, which the want of a repository, as well as the existence of very annoying regulations, render of a difficult access. Lastly, your Society proposes to publish among the papers of Schulz, the catalogue of Arabic manuscripts relative to history, which are in thirty-two public libraries of Constantinople. It is extremely desirable, that not only large libraries, but also those which possess only a small number of manuscripts, as well as learned men, following the example of Sir W. Ouseley and M. De Hammer, print their catalogue for the purpose; that every one may be able to know what is to be found in Europe, and accordingly to guide himself in his publications, and especially, that Europeans settled in the East, in full knowledge of the existing wants, may procure manuscripts to complete the collections of the Western world, and may save important works from destruction. A vast number of works, which are considered as lost, are undoubtedly extant in some obscure libraries of the East, but we must hasten to obtain them, as every thing conspires to accelerate their destruction. Everywhere in the East, excepting in China, learning is disappearing; manuscripts are no longer copied, and the libraries are dispersed by the accidents of war, and by the poverty of families. In looking over Musulman manuscripts, every one must have observed the seals of some member of a family effaced, which has become too poor as to retain the books, inherited from its ancestors, and is too proud as to let it become known, that it was obliged to sell them. The introduction of the press also contributes to the destruction of manuscripts by decreasing their prices and lowering the respect paid to them at former periods. It is, however, still time to save many of these treasures, and the publication of the catalogues of the European libraries, by directing the purchasers, must greatly contribute to the accomplishment of this purpose.

We will now state the progress which has been made in the literature of the different nations of the East. We observe, that the Arabian literature has been most actively cultivated. The Committee of the Oriental Translations of London has published the first volume of the History of the Arabs in Spain by Makkari, translated and accom-

panied with notes by M. Pascual de Gayangos, an erudite Spaniard.<sup>9</sup> Ahmed-al-Makkari-al-Telamsani is a Mogrebin author. Born about the end of the 16th century, he died at Damascus in the year 1631. After having composed a very detailed biography of the celebrated and learned vizier of Granada, Mohammed-Ibn-al-Khatib, he added to it in the form of an introduction, a General History of the Arabs in Spain, from the conquest to their final expulsion. The importance of this work has not escaped those authors who have occupied themselves with this part of the history of the Arabs, and Cardonne, Conde, as well as Shakespear, Reinaud, Lembke, and Fauriel, have made an extensive use of it in their works. It was of course designed for the study of Spanish orientalists; the more so, as Makkari is among the small number of authors who embrace the whole duration of the dominion of the Arabs in Spain. The first volume of M. de Gayangos' translation, which is a very considerable work, is now in your hands, and must be received with gratitude by all the persons who devote themselves to the history of the Arabs. The notes, which by the bye are of very unequal merit, are very numerous with regard to Spain, and contain extracts from a great number of Arabian historians. M. de Gayangos does not exactly give a translation of the original work; he transfers some chapters to introduce a more logical order into the narrative; he omits the life of the Vizier, of which he, however, retains extracts for illustrations; he excludes the fifth chapter, containing the lives of the Spanish Musulmans who travelled to the East, and also the 7th, which gives extracts of the poetry of the Arabs in Spain. It is difficult to judge according to a general principle about this system of translating Oriental works; it is certain, they often contain passages of little interest for the European reader, and relate the facts not in a very natural order; moreover, there is a rage among the Arabian writers, especially at the decline of their literature to quote verses, which is often very annoying for the translator, and of little benefit for the reader, and we may easily understand a doubt of the propriety of translating the whole, yet mature reflection will convince us, I think, that the system of complete translations involves into less difficulties, than that of incomplete ones. By this last method indeed, a work is produced much more agreeably to the general reader; those,

9. History of the Mohammedan Dynasties in Spain, from the text of Al-Makkari, translated by Pasc. de Gayangos. London, 1840, in 4to. vol. i.

however, who would use it for particular researches, cannot consult it but with mistrust, not knowing, whether the translator have not omitted the very facts which they are mostly anxious to obtain. Are there no readers who may regret that M. de Gayangos has rejected the first chapter? For the Spanish Musulmans who travelled in the East, undoubtedly were the most eminent men among their nation, so that their lives must naturally excite our curiosity.

The first book of the *Kitab el Aghani*, has been edited by Mr. Rosegarten,<sup>10</sup> and the second is nearly completed. He has accompanied it with the first part of a very curious dissertation upon the music of the Arabs, in which he endeavours to prove, that they borrowed their music from the Greeks. Whether his assertion be founded or not, will be ascertained by the end of the dissertation, which is to appear with the next book of the text, when the reasons adduced for its validity, will enable the reader to form his own judgment. Great care is bestowed on the text of the *Aghani*, and there is perhaps no other Arabian work which so much demands it as this collection of the lives of the poets, as it is one of the most curious documents of the political and literary history of the Arabs; for it is generally known, how much poetry had penetrated their whole life, and how almost all the information we have of their social and moral condition before Islamism, is derived from their poems and the commentaries on them. Mr. Lane has completed his translation of *One Thousand and One Nights*,<sup>11</sup> illustrating it to the end with notes, derived from so intimate an acquaintance with modern Egypt, as perhaps no European has ever possessed. The importance of these fascinating tales in oriental literature is incalculable; for they are even at our days the only work of Asia which has become perfectly popular, and these very tales have surrounded it in the eyes of the public with that poetic glory, which inspires so many with the curiosity of studying more deeply the literary treasures of Asia. It is especially this consideration, that every thing contributing to increase the attractions of this book, becomes important for oriental studies, and we must feel indebted to Mr. Lane for his having so well attained this object.

10. *Alii Isfahanensis liber Cantilenarum Magnus*. Ed. Rosegarten. Griepesvaldis, 1840 in 4to.

11. *The Thousand and One Nights*, a new translation from the Arabic, with copious notes, by E. W. Lane. London, 1839-41, 3 vols. in 8vo.

Mr. Veth has published at Leyden the first half of the text of *Lobbal Lobab* by Soyouti.<sup>12</sup> It is a Dictionary of patronymic names, and of others under which the Arabic authors are much more frequently quoted than under their proper names. The confusion under which the Arabs labour themselves to identify men known under different names, has induced them to prepare dictionaries for obviating this difficulty. Samani in the sixth century of the Hegira has published one, in which he does not only explain the sense and origin of these names, but also mentions with regard to every word the true names of the authors who have had them. This work was abbreviated in the succeeding century by Ibnal-Athir, and this extract again shortened by Soyouti. The work of Samani is at present unknown, if not lost, and the extract of Ibnal-Athir is only known by the specimen given by Mr. Wustenfeld, according to an incomplete manuscript of Gotha. Under these circumstances, Mr. Veth has resolved on publishing the text of Soyouti, who has preserved the definitions of the names, omitting, however, the enumeration of the authors who have borne them, and also the literary details his predecessors had added. The work of Soyouti, is therefore, far from containing all we would wish, but the excellent edition by Mr. Veth is nevertheless an acceptable present, not only because the *Lobbal-Lobab* explains the often bizarr surnames of the authors, but especially because it contains a great number of names of places, which we in vain are searching in the most complete geographical treatises. It is here perhaps not out of place to call the attention of Oriental travellers to the importance of the treatise of Samani, entitled "*Fil-Ansab*," the discovery of which would much contribute to the progress of Arabic bibliography.

This brings me back to two editions of Ibn Khalli-kan, which at this moment are printing at Göttingen and Paris. Mr. Wustenfeld has published the 7th book of his, while Mr. Slane has finished the excellent text he is editing.<sup>13</sup> A pamphlet has been lately published by Mr. Cureton, on an autograph manuscript of Ibn Khalli-kan, discovered by

12. This work has appeared in the form of an academical thesis under the title "*Specimen Litterio Orientalibus exhibens majorem partem libri. As. Soyouti de nominibus relativis inscripti* ———— proponit Johan. Veth. Lugduni Batavorum, 1480 in 4to.

13. *Kitab Wefayat Al-aiyan; Vies des Hommes illustres de l'Islamisme en Arabe.* par Ibn-Khalli-kan, publiées par M. le Baron MacGurkin de Slane. Paris, Fermin Didot, 1838-40, in 4to. cahiers i. iv.

him, and he would have fain entrusted it to Mr. Slane, as it seems to contain the second redaction of that work.

Mr. Freitag at Bonn, advertises the third volume of his *Proverbs of the Arabs*; the two first ones contain the classic work of Meidani, which the third volume will complete, with additional proverbs, not mentioned by this author, and which Mr. Freitag has for the greater part taken from an unedited work of Scherefeddin, and from the proverbs of the Bedooins by Mr. Burckhard. The work will be closed by very copious tables of contents, to enable the reader to find the proverbs which the Arabian authors often indicate by a single word.

Mr. Sprenger, under auspices of the Committee of Translations, has edited the first volume of his English translation of the celebrated work of Masoudi, "*The Meadows of Gold*."<sup>14</sup> Masoudi wrote in times most favourable for a historian; the Khalifat in the beginning of the 4th century of the Hegira had obtained almost its largest extension, the intellect of the Arabs was not yet put down by the grammar, the rhetoric, and the controversies of the sects, their genius was still stimulated by the remains of the ancient civilisation, and by the literature of the conquered nations, and the position of the Khalifat facilitated the most distant travels. Masoudi availed himself of all these advantages; his reading was immense, his travels uninterrupted, and very extensive. According to the custom of the learned men of his time, he has written on almost all subjects which then could interest Musulman readers; but for us his historical works alone are of interest. The first of his compositions is *Akhbar-al-Zeman*, an enormous work of at least twenty volumes; the second is the *Kitab-al-Aouscth*, being the complement to the *Akhbar*; and the third, the "*Meadows of Gold*," forming at the same time the extract and the supplement of the two others. This last work alone is known in Europe. Written with a singular want of order and method, it contains the most curious information on a great number of subjects. Not being a mere compiler, as are most of Oriental historians, Masoudi made a great many personal observations and researches on subjects neglected by his predecessors. Mr. Sprenger has compared for his translation the manuscripts of Leyden, Paris, and London, and always added the Arabian orthography of the names, which is of great assistance

14. El Masudi's *Historical Encyclopedia*, entitled *Meadows of Gold and Mines of Gems*, translated by Aloys Sprenger, vol. i. London, in 8vo.

in the use of a work, abounding with names of men and places ; and he also joins to it a certain number of critical and explanatory notes. This work will require much more extensive commentaries, if the variety of subjects to which allusion is made by Masoudi, shall be elucidated ; but the first thing is a complete translation, and it is highly desirable, that Mr. Sprenger should continue his useful and excellent undertaking.

Since the conquest of Algiers by the French, the history of Northern Africa has become a subject of great interest, and we are presented in the past year with many works relating to it, and others we are promised, so that this portion of the history of the Arabs, about which we only possess the very imperfect labours of Cardonne, will soon be numbered with those best known to us. Mr. de Slane has published in the *Asiatic Journal*, the history of the first Masulman dynasties in Africa, and has advanced it to the Aglabites, where Mr. Noël Desvergers takes it up in a work entitled “ *Histoire de l’Afrique sous la dynastie des Aglabites, et de la Sicile, sous la domination Musulmane.*”<sup>15</sup> He gives the text and translation of the narrative of Ibn Khaldoun, accompanying it with notes, principally taken from Nowaïri and Ibnal-Athir. The Aglabites, after having governed the eastern part of the coast of Barbary during the whole third century, were dispossessed of it by the dynasty of the Fatimites, which in their turn for nearly three centuries possessed the greatest part of Moghreb. Mr. Nicholson<sup>16</sup> has edited at Tübingen, an English translation of the history of the establishment of this dynasty, taken from a manuscript of the library at Gotha, erroneously attributed to Masoudi. The work of the unknown writer seems to have served as basis to the narratives, as well of Nowaïri as of Ibn-Khaldoun, and he enters into more details than these two authors have done on this great event of the history of the Khalifat, an event which threatened the existence of the Arabian empire, and to which Europe perhaps owes its escaping from a Musulman conquest.

The French government, well aware of the importance of the history of North-Africa, has for some years made efforts to procure all the means for elucidating it. With much propriety it has attached a great value to that portion of the great work of Ibn-Khaldoun, which under

15. Paris, chez Didot. 1840, in 8vo.

16. An account of the establishment of the Fatimite Dynasty in Africa, by J. Nicholson. Tübingen and Bristol, 1840, in 8vo.



the title of the "History of the Berbers," treats all that during the middle ages refers to the Moghreb. It has charged Mr. de Slane with the publication of this important work, which will be printed at Algiers, and form two large volumes, containing the text of Ibn-Khaldoun, a French translation, and a historical commentary. The editor has succeeded in collecting a sufficient number of manuscripts, and the unwearied kindness of Mr. Weijers, has placed at his disposal the manuscripts of the library of Leyden. The printing of this work has commenced, and from all circumstances we may hope, that this excellent undertaking will be brought to a close as speedily as possible.

Mr. Cureton, conservator of the manuscripts of the British Museum, has commenced printing the History of Religions by Scharistani, written in the first years of the sixth Hegira. The labours of Pococke and Hyde had a long time since spread the fame of this work, which successively treats respecting the orthodox and heretic sects of the Muslims, the philosophic schools, the Persian and Sabeian sects, the superstition of the antient Arabs, and especially contains on these last subjects a mass of facts, which elsewhere in vain are to be looked for. It is one of those Arabic works, which in our time, when the history of religions has become the object of so much research, will excite the most vivid interest of the public, and we cannot help congratulating the Society for the printing of Oriental texts, to have selected this as their first publication. As Mr. Cureton has no intention of giving a translation, it is a fortunate circumstance, that Mr. Schmoelder at Bonn has been since some years occupied in preparing a translation and edition of the same work, and it is possible, that the undertaking of Mr. Cureton, from which he may derive so many facilities for his translation, may induce him to relinquish the publication of the text. Mr. Schmoelder is eminently qualified for a labour of this kind by his studies of the philosophy of the Arabs, the first result of which he has given in his "*Documenta Philosophiæ Arabum*, Bonn, 1836," promising at the same time a new work of the same kind, which is to contain some memoirs on the philosophy of the Arabs, preceded by a treatise of Ghazali. This labour has met with the approbation of the Academy of Inscriptions, which has been recommended to the Minister of Public Instruction, to add it to the number of works encouraged by the French government.

Mr. Dernburg is preparing an edition of the *Tarifat* of Djordjani, together with a French translation and a commentary. The *Tarifat* is a dictionary of the technical terms of Arabic Grammar, Philosophy, and Theology, and you all know, what value Mr. de Sacy attached to this work. Mr. Dernburg takes as basis of the redaction of the text, the edition of Constantinople compared with the manuscripts of Paris. I should besides mention a work of Ibnal-Beithar on the medicine of the Arabs, which Mr. Sortheimer is translating into German.

The Semitic dialects have furnished this year a subject of new and curious studies. Every body knows, that on ascending Mount Sinai from the Gulf of Suez, one may follow some collateral valleys, intersecting the foot of the mountain, which exhibit on the walls of the rocks they traverse, inscriptions not yet decyphered. One of these valleys abounds so much with them, that it has received the name of "Wadi Mokatteb," the valley of inscriptions. A great number of them have been published in different works, and Mr. Beer at Leipzig, who has already distinguished himself in other branches of oriental paleography, has undertaken the task of decyphering them. He has printed the first part of his labours, forming the third part of his "*Studia Asiatica*,"<sup>17</sup> and the conclusions at which he has arrived are, that these inscriptions date from the fourth century, that they are written in one of the Semitic alphabets and dialects, and that they are the work of the Nabatenés.

With regard to Persian literature, only one work referring to it has become known to me; viz. Sadi's *Galistan*, translated into the German, by Mr. Wolff, in a most elegant manner.<sup>18</sup> Other works are commenced or advertized. Your associate, Mr. Troyer, has under the press an English translation of the *Dabistan*, a work which has a long time excited the curiosity of the learned. It is a history of religions, written in Akbar's time, by a Guebre, Mobed Shah, who turned Musulman. The intention of the author appears to have been to furnish to Akbar, a pretended historical basis of the religion which this emperor had invented, and which he was desirous to introduce. For

17. *Studia Asiatica*, edid. Beer fasc. iii. Lipzig, 1840, in 4to. The first two numbers of this work have not appeared, and the author unfortunately died since the publication of it.

18. Sadi's *Rosengarten*, übersetzt durch Dr. Ph. Wolff. Stuttgart, 1841, in 12mo.

this reason, the author commences with a very long chapter on the religion of the Mahabadians, which is a mere web of incoherent fables. He then thoroughly enters into his subject, treating on the religions of the Persians, Indians, Jews, Christians and Musulmans, on the Illuminati, the Sofis, and some other sects. This work cannot be used without a certain mistrust; it contains, however, on those obscure sects an infinite mass of details, which will serve to complete the history of religions. Sir W. Jones, I think, first mentioned this work. Gladwin published in the "New Asiatic Miscellany," its first chapter, together with an English translation. Leyden in the 9th volume of the Asiatic Researches, translated the chapter on the Illuminati, and the text of the whole work was published at Calcutta in 1809. The Committee of Translations charged Mr. Shea with the translation of it; but as he died without having made a considerable progress in the work, Mr. Troyer has engaged to complete and to publish it.

The English Society for the publication of Oriental Texts, advertises three Persian works, of which it prepares editions; viz. Khamschi Nizami, that is, the collection of five poems, half epic, half romantic, by Nizami, of which as yet only one, the Secander Nameh, is printed; the second is the Youssef and Zuleikha by Furdusi, which Mr. Morley has undertaken to publish. It is Furdusi's last work, written during his flight. It was considered as lost, but was found again a few years since by Mr. Macan. The third, a part of the great work of Raschid-eddin, is the History of India. You know, that Raschid-eddin deposited copies of his work in a certain number of libraries, and Mr. Morley was fortunate enough to discover one of these authentic copies. He intends to publish that part of it which treats on the History of India, as it is one of those which are not met with in the manuscripts of Raschid-eddin in the libraries of the continent.

We have here the best opportunity of mentioning a remarkable work, which is indebted for the new and important facts it contains to the Persian historians, consulted by the author; we allude to the History of the Golden Horde by M. Hammer de Purgstall.<sup>19</sup> It is well known, that the Golden Horde has reigned in Russia for more than two centuries, exercising the greatest influence on the formation and fate of the Rus-

19. Geschichte der Goldenen Horde in Kiptschak dar ist der Mongolen in Russland, von Hammer Purgstall. Pesth, 1840, in 8vo.

sian empire ; however, a detailed and special history of this important branch of the Mongol empire was required, and the work referred to, in which M. de Hammer displays his vast learning, has fully supplied this want. He does not only follow the History of the Golden Horde, from its origin to the destruction of the empire founded by it, but he also adds new and important facts on the general history of the Mongols, among which the reader will certainly distinguish the description of the organisation of the Mongolian court, forming the fifth book, and the collection of patent letters, addressed to a considerable number of Mongolian civil and military officers. The author, who intends to prosecute this subject, will soon publish a History of the Mongols in Persia, for which a long time he has been collecting materials.

Before leaving Musulman literature, I cannot omit mentioning the French-Turco Dictionary by Prince Handjeri in Petersburg, which will form three large volumes in 4to., and the first volume of which has appeared.

All persons, most advanced in the Turkish language, are unanimous concerning the great merits of this beautiful work, which is a complete translation of the Dictionary of the French Academy. It is more especially destined for Turks who are studying the French, while the Franco-Turkish Dictionary, which M. Bianchi is publishing in Paris, and of which the printing is nearly completed, appears especially to be destined for European students in Turkish.

In speaking of India, we have received the fourth volume of the Mahabharat, containing the end of the text of the Mahabharat itself, and the continuation of this grand epic, known under the title of Harivansa. We venture to hope, that the Asiatic Society has not relinquished the purpose of completing this work by an onomastic index, to facilitate the use of this immense magazine of Indian traditions.\*

The Vedas, now very imperfectly known by the Memoir of Colebrooke, and the first volume of the Rigveda by Rosen, are at this time everywhere the object of the labours of Indian scholars. The Committee of Translations have accepted the offer of Mr. Stevenson of Bombay, to

\* Such an index has been prepared. The Mahabharat is published by the Asiatic Society of Bengal, with the assistance of the printing fund allowed by the Government of India.

publish a translation of the Sama Veda, which in the ceremonies of the Brahmans, seems to occupy a similar place as the Mass in those of the Catholics. Mr. Wilson prepares for the same Society the texts of the prayers and hymns of the Yadyur-Veda. These hymns composent the real body of the Vedas ; they are, to say so, of a primitive formation, and give the first seeds by which the Indian race since that time has exercised such a great influence upon the progress of the human mind. Much later were added to the Vedas a certain number of Upanishads, which are in fact like so many appendices, some of them being commentaries of the hymns, while others contain a systematic explanation of the doctrines of the Vedas, the first result of the tendency of the human mind to reduce religious tradition to a system. You are aware, that Mr. Poley some years ago commenced a lithographed edition of the Upanishads, which he was unable to complete on account of his departure to London ; but he is determined to resume his labours, and now advertises an edition of Vishadaranyaka, one of the Upanishads of the Yadyur-Veda. The print of this work is also commenced at the expence of the Oriental Text Society.

The Indian drama, to which so much attention has been attracted by the labours of Jones and Chezy, and especially of Wilson, has occasioned some publications. Prema-ehunder, Professor of the Sanscrit College at Calcutta, has published a new edition of the Sakontala, which contains no other additions to the text than a Sanscrit translation of the passages written in Pracrit, and appears to be destined for the natives of Bengal. To judge by the adoption of Bengalee characters, Mr. Boethlingk at Bonn, promises a new edition of the same drama according to the manuscripts of London, which considerably differ, and this in important passages from the text of Chezy. This translation is to be accompanied with a Latin translation and notes. Another drama ascribed, but probably erroneously as so many other poems, to Kalidasa, the author of the Sakontala, has been published at Bonn by M. Tullberg ; viz. the Malavica and Agnimitra.<sup>20</sup> Text and variation only as yet appeared, but M. Kullberg promises likewise a Latin translation and notes. A third work, attributed to Kalidasa, the Meghaduta, of which Mr. Wilson had already published an edition, and a very elegant English

<sup>20</sup> Malavica et Agnimitra, edidit Fr. O. Tullberg, Fascicular prior textum Sanscritumtenens. Bonn, 1840, in 4to.

translation, has been reprinted at Bonn by M. Gildemeister, who has added to the same volume a little erotic poem of the title "Sringari-Tilaka." Both texts are accompanied with a complete dictionary. Raja Kalikrisna at Calcutta, advertises an edition an English translation of Maha Nataka, that is to say, the great poem. It is a half dramatic narrative of the Ramayana, which is at present known in Europe by the short analysis only of Mr. Wilson. This work, of which the ape Honuman is believed the author, enjoys great popularity in India. Mr. Hoepfer has published at Leipzig a small volume, containing the first series of translations of Indian poems, the metre of which he imitates in German.

The Indian Grammar has been the object of some labours, of which the most important is the second volume of the edition of Panini, edited by Mr. Boethlingk,<sup>21</sup> and the tables, arranged by the editor, much facilitate the use of it. Mr. Hoepfer has published a dissertation on the infinitive in Sanscrit,<sup>22</sup> considered under the view of the comparative Grammar and of the Synthesis. Mr. Westergaard has edited the second part of his Sanscrit roots.<sup>23</sup> The progress of Indian literature since the print of Rosen's Radices, enabled Mr. Westergaard to extend the plan, and to fill out the sketch given by Rosen. Mr. Johnson lastly, has published in London the first volume of the Hitopadesa, together with a grammatical index of all the words. This book is destined for beginners.

The religious controversies, always disturbing India, which from the intercourse of the natives with Europeans had recommenced with renewed ardour, especially at Bombay, have caused some curious publications; I shall offer, however, a remark on only two of them. The first is an antient Sanscrit treatise under the title of "Wajrah Soutchi,"<sup>24</sup> by a Buddhist of the name Aswa Goscha, who therein attacks the Brahminical institution of caste. Mr. Wilkinson, political agent at Bhopal, who discovered it, intended to print it as a work, attacking caste, but the Pundit Soobaji Bapoo, whom he employed for this purpose, requested his

21. Panini, 8 Bücher Grammatischer Regeln, herausgegeben von Dr. Boethlingk, 2 vols. in 8vo. Bonn, 1810.

22. Vom Infinitiv, besonders im Sanscrit, von Dr. A. Hoepfer. Berlin, 1840, in 8vo.

23. Radices Linguae Sanscritae definitiv, Nic. L. Westergaard. Bonn, 1841, in 8vo.

24. The Wujra Soochi, or Refutation of the arguments upon which the Brahmanical institution of Caste is founded by the learned Buddhist Arhwa Gorhu. ch.

permission to add to it a refutation under the name "Tanka," also written in Sanscrit, and thus appeared this small volume in Bombay. The second theological publication is the *Ta'limi Zerdusht*, a (Mobed) *Parsee Dasabhai*. This work, composed in the language of Guzerat, and printed in Bombay, contains a defence of Zoroaster's doctrines against the American Missionaries, together with a refutation of Christianity, in which he adopts the arguments of Voltaire against the doctrines of the Catholic Church.

When the progress of a science is very rapid, a scholar would not like to publish a general work to represent the actual state of this science at his own time. This repugnance is very natural, as we know that such a labour will be soon superseded, although works of this kind are eminently useful, not only for the general reader, but also for the learned to whom they represent the history of the former periods, and indicate the wants which they are called for to supply. This service has Mr. Benfey in Berlin, afforded to Indian studies, by selecting and combining the most positive information which we possess about the antient geography, history, and literature of India.<sup>25</sup> In this conscientious work, we observe interesting researches on the study of the antient navigation of the Hindus, on the importance of the study of Buddhism for the History of India, and we are sure, that every one, consulting this work, will derive great benefit from it.

Chinese literature has not given occasion to a great number of works. Mr. Pauthier has under the title of "*The Sacred Books of the East*," edited a large volume, containing a collection of works, on which the religion and legislation of some great nations of the East are founded.<sup>26</sup> In this volume are embodied the *Chou-king*, (according to) in the translation of Gaubil, revised by the editor according to the manuscript of Gaubil himself, the four Moral Books of Confucius' school, translated by Pauthier, the *Laws of Menu* according to the translation of Lois  leur, and lastly, the *Kor  n*, translated by your associate, Mr. Kasimirski de Biberstein. This work is destined to render some of the most fundamental works of the East more accessible to the public, while

25. *Indien*, von Th. Benfey. Leipzig, 1841, in 4to. partly taken from the *Cyclop  dia of Ersch and Gruber*.

26. *Des Livres Sacr  s de l'Orient*, traduits ou revus et publi  s, par M. Pauthier. Paris, 1840, in 8vo.

at the same time it affords the evidence of the interest the public have in such undertakings; for the translation of the Korān by Mr. Kaimiraki which it contains, is already the second edition within a year, and the printing of a third one is commenced. Mr. Pauthier has also occupied himself with a new edition of the Moral Books of the Chinese, contained in the volume of which I am speaking, and moreover published the Statistical Documents on the empire of China, translated from the Chinese, (Paris, 1841, in 8vo.) They are taken from the official statistic, entitled "Tai-tsing-hoeitien," which give a detailed account of the state of population, and the revenue of each province.

Mr. Bazin advertises the speedy publication of a work, which will highly excite the curiosity of the public; viz. the complete translation of the Pi-pa-ki, a drama of twenty-four pictures, written by Kao-tong-kia, in the fourteenth century under the dynasty of the Youens.

Tsai-yong is a historic person, who at the commencement of the third century of our era, was president of the tribunal of the historians. He is one of those savans, often presented to us in the history of China, who became martyrs to their patriotism; for not being allowed by the emperor to finish the history of the dynasty of the Hans, he died in prison of mental anxiety, arising from the frustration of his purpose. The Pi-pa-ka, however, not treating this catastrophe, introduces Tsai-yong in his youth. The Chinese critics cannot find adequate language to praise the elegance and the varied merits of this drama, which in their eyes has no other rival than the Si-siang-ki, and they raise it even above this, as in the Pi-pa-ki they find with equal poetic beauties a more pure morality. Whatever value may be attached in Europe to the Pi-pa-ki, it must always be highly estimated, considered as a picture of the customs of the Chinese in the fourteenth century.

Round the four great literatures, the Arabian, Persian, Indian and Chinese, must be placed the literature of other Oriental nations, which have not become themselves centres of civilization, but borrowed their ideas from one or the other of those great nations. In them we must therefore not expect works, stamped with originality, which have made an epoch in the history of mankind. Nor may we hope, that a great number of learned men will cultivate them; but it is desirable that they may not be altogether neglected, and that the wants of government, of commercial transactions, the enthusiasm of the Missionary, or the zeal



of the learned, will gradually put them into fuller light, and give the historian access to the facts which may be derived from them, since almost each of those nations, according to the international influence it has enjoyed, is possessed of more or less important chronicles; most of them have also a popular poetry, and their work in theology and in general literature give at least evidence, how far the influence of those nations extended, from which they have borrowed their leading ideas and forms of art. The grammars and dictionaries of their languages by furnishing historic facts, not recorded in the chronicles, are indispensable for ethnography; lastly, each of them has an importance of its own, and fills a corner in the general picture of the East.

Some of those languages during the last year have given occasion to publications. The study of the Georgian language, which the Asiatic Society has first encouraged, has now taken root in Russia, its genuine soil, where it can flourish under the influence of the wants of government. Mr. Brosset, under the title of "*Matériaux pour servir à l'Histoire de Géorgie*,"<sup>27</sup> has edited a new redaction of the translation of the Georgian chronicle, the first edition of which was published some years ago at the expence of the Society.

Mr. Tchoubinof, employed in foreign affairs in St. Petersburg, and a Georgian by birth, has edited a Georgio-Russian-French Dictionary,<sup>28</sup> infinitely richer than vocabularies we previously possessed. The basis of it is that of Soulkhan Saba, which in Georgia was considered as the best, and together with the additions of Mr. Tchoubinof, contains about 35,000 words.

Mr. Dorn in Petersburg, has published an Afghan Grammar;<sup>29</sup> more exact than Klaproth's, and more detailed than that of Ewald. The literature of the Afghans being scanty, and to our present knowledge mostly consisting of imitations of Persian poetry, the scientific interest in the Afghan language is essentially ethnographic, for the problem of the origin of this people is not yet resolved, and the elements of its solution are to be found in the grammar and dictionary of their language.

The Malayan dialects, almost entirely neglected on the continent of Europe, have lately attracted some attention, and Mr. Dulaurier has

27. Taken from the *Memoirs of the Academy of St. Petersburg*, 1840, in 4to.

28. *St. Petersburg*, 1841, in 4to.

29. Taken from the *Memoirs of St. Petersburg*, 1840, in 4to.

opened a course of lectures on the Malayan language in the school of the living languages. Not to mention that this language has its own literature, it is of great importance for ethnography, as the restless and trading race of the Malays is spread over an immense range of coasts and islands, and the history of this idiom for the greatest part is also that of the maritime population of the Eastern and Southern seas. A great scholar, the late Mr. W. De Humboldt, had seized on the solution of the problem which the origin of these people offers, and most thoroughly investigated it in his masterly work on the Kawi language;<sup>30</sup> the last two volumes of which have appeared last year under the auspices of the Academy of Berlin by the care of Mr. Buschmann. He founds his researches on the Kawi, the antient language of Java, reconstructing its grammar by analysing the text of *Brata Yuddha*. Then proceeding to a similar analysis of the other Malayan dialects from the Philippines to Madagascar, he supplies the insufficiency of his resources by the strictness of his method, and by the astounding penetration of his mind. The grammatical investigation is enriched in all parts of the work by memoirs concerning the influence of India on the Malays, on the antiquities of Java, on the influence of writing on language, etc. memoirs which render this work a mine of new and important ideas, and where the penetration and the mental power of the author are equally displayed.

Mr. Buschmann advertises, that he intends to publish the text and translation of *Brata Yuddha*, which will form the complement to Mr. De H.'s work. It is an epic poem, an imitation of the *Mahabharat*, of which Raffles had already given a part in Latin characters. Written in Kawi, it dates as the Indian Poem to a period when the influence of Indian ideas in Java had not yet submitted to the Musulmans.

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After having presented to you this sketch, unavoidably incomplete, of the progress that Oriental literature has made since our last meeting, I would desire to add a few words concerning a subject which has occupied, and is now occupying a great many learned men, and which deserves the whole attention of a Society, destined for the interests of Oriental literature. I allude to the variety of systems, at present

30. *Über die Kawisprache auf der Insel Java*, von W. Humboldt. Berlin, 1826, 39, 3. vols in 4to.

adopted, to express the Oriental by Roman characters. At the first intercourse of Europe with the East in the middle ages, oriental words were rendered in a most barbarous manner; and thence arose the origin of a certain number of monstrous names, some of which have been retained in all languages of Europe, as Mahomet, Mosk, Tamerlan, Gengiakan. Since the last half of the seventeenth century, the Latin translations of some Arabian works by Pococke, Golius, and others, and a little afterwards the popular works of Herbelot and Galland introduced a more exact orthography, by rendering the Arabian words as faithfully as the comparative deficiency of this alphabet permitted. A long time people were satisfied with this method of writing, but at last, and especially since the discovery of the Sanscrit had enlarged the circle of oriental studies, the want of a stricter method became apparent. A degree of exactness was aimed at to render again in the original characters, what had been previously expressed by the Roman alphabet; the systems, however, previously adopted, were unfit for this purpose, and whosoever attempted to reconstrue in Arabian characters verses, quoted by Herbelot, must have been convinced of this.

Since that period, systems rapidly succeeded each other. Founded on the most different principles which were calculated to avoid difficulties of several kinds, they have produced the most opposite results. Sir W. Jones so early as the year 1788, complained of almost every author having a system of orthography of his own. What would he have said of the number of systems, and the still greater number of orthographies without any system in the present day. Historians, geographers, travellers who never study the languages of nations, take at random the different orthographies and confound them, so that it is impossible to trace them to their sources, and hence ensues a mass of confusion. Of this I shall give some examples by taking the easiest familiar names I at present recollect. For instance, the name of Ali in works of our time is found thus: "Ali, Aly, Ali, Alee, Ulee, Ullee, Alli, Aliyy, Ahli, Alee." I find nine ways of expressing the word Koran: "Kuran, Ckooran, Alcoran, Alcorawn, Qoran, Coran, Koran, Ckoran;" six to write the name of Aboulfeda: "Aboulfada, Aboulfeda, Abulfeda, Abowlfida, Abowlfeda, and Aboulfidai," and seven for the name of the legislator of the Arabs: "Mahomet, Mehemet, Muhammed, Mohammed, Muhammad, Mohhammad, and Muhummud."

In names so well known as those just quoted, there can hardly arise errors from these discrepancies in orthography; but in names of obscure men and places, the confusion arising from it, may be easily imagined. I shall give an example. Mr. J. Prinsep quotes an official and modern map of the Duab, where the road from Akbarpore to Cawnpore, a road very much frequented, is doubly entered, because the topographic bureau of Calcutta had found two routes with names, written in such different ways, that their identity not being recognised, they were believed to refer to parallel routes.<sup>31</sup>

It would perhaps have been better never to have deviated from the old system, however imperfect it was, as the thing of real importance is uniformity. But now it is too late to retrace our steps; the want of exactness having once been perceived, we must endeavour to supply it, hoping the introduction of a system, infinitely superior to the others, will re-establish that unity from which we are so far at present.

It is, meanwhile, I hope, not without use to classify the difficulties which such a system offers, and the attempts which have been made to remove them. These difficulties, it appears to me, are the following:—

1. Oriental alphabets have a much greater number of letters than ours.

2. Orientals do not always pronounce according to the rules of orthography.

3. They disagree in the pronunciation of the same letter in every country.

4. Europeans disagree in the pronunciation of the same letters.

1. Oriental alphabets have a much greater number of letters than ours. This especially has application to the Arabian and Indian alphabets. The means to obviate these difficulties, may be reduced to three classes.

a. The attempt has been made to enrich the Latin alphabet with some new characters. Thus has Meninski introduced the Arabian *Ain*; Volney modified the form of some Roman characters; Mr. Gilchrist invented a short *u*, and other learned men at a still later period used some Persian and Greek characters in their systems of rendering.

31. See the Map in "The application of the Roman Alphabet to all the Oriental Languages." Serampore, 1834, in 8vo.

None of these systems, however, were universally adopted, and the European public is not willing to tolerate the introduction of new characters into its alphabet.

B. It has been proposed to represent Arabic and Indian sounds by groups of European characters, as dh, th, kh, tt, ss, etc. This system has produced a great number of essays, but it has real inconveniencies; for if partially applied only, as the greater part of the learned do, the object which was in view with regard to it, is not attained; and if carried to the extreme, it renders strange the form of Oriental words, affording combinations of characters, which must appear barbarous to a European reader, as "Ckasr or Qasr, Hhadrat, Hadjdjadj," etc. Moreover, the system of expressing by double characters the simple ones which we do not possess, has the great drawback of leaving the reader in the dark concerning the orthography of the original, because he cannot know, whether the double character represent two characters, or be only the conventional representative of a single one.

C. Lastly, others have tried to modify the Latin alphabet by marks, not very apparent, which without producing new characters, exhibit various forms, by which the letters of Oriental alphabets may be easily exposed. This system, I think, was first proposed by Sir W. Jones, and adopted by the Asiatic Society of Calcutta, which, however, did not always adhere to it. According to it, the vowels are multiplied by accents, when they are short or long, and the consonants by points above or below. This system has had many imitators, and almost all Indian scholars have made similar ones for their rendering. Gilchrist has partly preserved it; the Geographical Society of London has adopted it with a few modifications; Mr. Erchhoff in France has made use of it in his parallel of the European languages; and lately, has Mr. Brockhaus proposed a similar one in Germany; Mr. Weijers has published another, resting on the same basis, and Mr. Arni, of Turin, has formed characters, on which he marks the different t, d, s, etc. of the Arabs by the same points, by which they are distinguished in the Arabic language. This method has the inconvenience easily to occasion errors, and to require a much larger printing apparatus, but it atones for these material difficulties by evident advantages. The European is not inconvenienced in his reading, for if he do not know the signification of the points added to the characters, he may easily overlook them, and

without their introducing an error, the reading of the words is not crammed with a mass of supplementary d'h and other characters; lastly, it approaches much nearer to that which only attempts to render the simple sound, without pretending to imitate all its shades, so that it is easy to identify words, written by a scholar, with those which a traveller, according to the mere pronunciation, has written down. The great mischief at present is the variety of systems, founded on this method; for we cannot expect, that the public shall become accustomed to this modification of the alphabet, unless the signs be generally adopted.

2. The Orientals do not always pronounce according to the rules of orthography, and this difference between the manner of writing and of pronouncing especially arises from euphonic laws. They, for instance, write al-Raschid, while pronouncing ar-Raschid. Mr. Weijers proposes to distinguish a character, subject to such a change, by putting it in italics; but this expedient displeases the eye, without indicating to the reader the real pronunciation. This problem is evidently insoluble, and we have the choice between the sound and the orthography. The custom of the European nations with regard to this has established the excellent principle of submitting ourselves to orthography; this is written in all European languages "Shakespeare, Bordeaux" etc., though the sound to be derived from this combination of letters, be much different from the real pronunciation. To follow the orthography is the only means not to efface the etymology of a word, and to preserve a chance of unity in renderings; yet there always remains a great confusion in the representation of short vowels, so differently pronounced in different words of the same language, that it becomes difficult to express them in all instances by the same vowel of our alphabet.

3. One and the same letter is differently pronounced by every Oriental nation. The Turks, for example, generally substitute for the short A of the Arabs and Persians a short E; the Musulmans of India in many instances pronounce an E long, when the Persians pronounce a long I; in Persia a long A is substituted for a long Ou.\* The Ara-

\* My readers will remember to give the sound of these vowels as in French.

bian ج is differently pronounced in different countries. The era of Mahomet, for example, is pronounced Hidjret in Syria, Higret in Egypt, Hijret in Arabia, etc. The confusion, arising from these variations, is often very great ; for instance, the name of the present king of Lahore, is pronounced Schîr Singh in India ; the first part of this name is, however, of Persian origin, and is pronounced in Persia Schîr. How then to render ? The most logical method, even in a similar case, would perhaps be to adopt the pronounciation of the country where the word originated ; but there fortunately are not many so complicated cases, and ordinarily, the renderings of a word may be without inconvenience in conformity with the orthography of the country from which it is borrowed.

4. The last difficulty is, that the European nations likewise differ in the pronouncing of one and the same Roman character, and at the first glance, this appears an insurmountable obstacle to a uniform system. Sir W. Jones was well aware of the confusion connected with this question, especially for the English, whose orthographical system is so complicated, irregular, and so deviating from the usages of all the rest of Europe. He had the wisdom to propose the adoption of the Italian pronounciation, and persuaded the Asiatic Society of Calcutta to consent to it, which since that time has continued to follow this system, the only one, by which the English Oriental scholars can be in conformity with those of the continent. Subsequently Mr. Gilchrist unfortunately did all in his power to undo the work of Sir W. Jones, by substituting the complicated English diphthongs for the simple vowels of the Italians. Almost all his pupils have adopted his system, and the Oriental geography and history have too much resented this unfortunate alteration. The oo, ee, u, have taken the place of the u, i, a, in most of the modern books of the Anglo-Indians, and the authority of all the learned Societies of England and India has in vain up to this time opposed this nuisance, though it appears to have lost ground, and we must hope that the principles of Sir W. Jones will again take the lead. There remain some other difficulties ; the letters g, j, e and ch, (v, w, s, z,) have in every European language a different pronounciation, so that a congruous alphabet could not be adopted with uniformity in all European languages. These difficulties, however, not being very numerous, would not occasion much confusion, if every nation, as much as its idiotisms

allow, try to approach to the others, and not prefer the extremes of its peculiar pronunciation, as the school of Mr. Gilchrist has done.

All these mutual concessions being granted, and all precautions taken, I do not think, that a uniform alphabet will be obtained, by which Oriental characters should be introduced into the text. It is generally known, what importance Volney attached to this idea, and the Committee of Public Instruction in Calcutta for some years thought to have so clearly solved this problem, as to encourage the publication of a great number of works in what is named, the Roman alphabet in India, and that this Committee for some time has suggested the truly monstrous plan of substituting, even for the natives themselves, this alphabet for their original ones. This experiment has not succeeded, and could not succeed; a system of expressing intelligibly an occasional passage of a language, and which may be useful for quotations, or when the original characters are wanting, may be applied to some languages, as for instance, has been done to the Sanscrit; but there are other languages which do not admit this expedient, as for instance, the Arabic language, where the orthography not only expresses the sounds, but often also the grammatical and etymological peculiarities which do not touch the ear, and would be lost by any rendering; thus I doubt, if any combination of Roman characters could represent the orthography of the word Koran. But there is fortunately no necessity for supplanting oriental characters; from this might arise some economical advantage in printing Oriental texts, but it would be infinitely less than the inconveniencies of every kind produced by it. We are rather in want of a system of expression sufficiently exact to reproduce the names of men and localities in a way which may approach to the ordinary application of the Roman alphabet, so that it is not repulsive to the mass of readers and authors, and only requires slight modification in its application to the languages of Europe. The adoption of a system, corresponding to these conditions, would be a benefit to literature, and no public body holds a better position than a Society such as yours to encourage and to direct discussion on all the points connected with it, and to arrive at a result which could obtain the assent, if not of all, which cannot be expected in such a matter, but at least of the majority of authors.

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*Proceedings of the Asiatic Society.**(Friday Evening, 6th May, 1842.)*

The Hon'ble H. T. PRINSEP, Esq. President, in the Chair.

G. CHEAP, Esq. C. S. was proposed a Member of the Society by the President, seconded by the Secretary.

*Books received for the Meeting on the 6th May, 1842.*

*Journal of the Royal Asiatic Society of Great Britain and Ireland.* London, 1841, vol. vi. No. 12, 1 vol.

*Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society of Great Britain and Ireland.* London, 1841, (5 copies,) pamph.

*The Calcutta Literary Gleaner*, May, 1842, vol. 1st, No. 3rd, pamph.

*The Calcutta Christian Observer*, May, 1842, new series, vol. 3rd, No. 29, pamph.

*Report on the Settlement of the district of Seharanpore*, compiled by E. Thornton, 1840, 1 vol.

*Actes de L'Académie Royale des Sciences, Belles Lettres, et Arts de Bordeaux.* 1er. à 4e. Trimestres. Bordeaux, 1839, 4 vols.

Read a note from Dr. R. M. THOMPSON, presenting a Human Skeleton for the Museum of the Asiatic Society.

Ordered,—That the thanks of the Society be accorded to Dr. THOMPSON, and he be requested at the same time to state from whence the Skeleton is.

On the 22d April last, enquiry was made through Mr. Secretary BUSHBY, as to the number of copies of Dr. CANTOR's Report on Chusan, (under publication as an article in the Asiatic Researches,) would be required by Government.

Read letter of 27th idem from Mr. Deputy Secretary BAYLEY, intimating that the Government would require 50 copies with the Drawings in illustration. The Secretary at the same time submitted to the inspection of the Meeting the drawings referred to.

Read letter of 4th May 1842, from Reverend J. THOMAS, submitting Bill for printing the Index to the several volumes of the Mahabharut, and for binding the same, amounting to Co's. Rs. 2,012: 7: 9. Ordered to be paid.

Read the following two letters of the 13th February, and 10th March 1842, from Captain W. MACLEOD.

*Moulmein, 13th Feb. 1842.*

MY DEAR TORRENS,

The accompanying Image is one of two just sent me from Rangoon, (where it was dug up,) by order of the King's uncle, the Mekhara Prince.

The Prince is an honorary member of the Society, (vide his letter on his election 5th February, 1836, page 433,) and has a philosophic turn. He assisted greatly in the compilation of Mr. Lane's Dictionary of English and Burmese. If circumstances

permitted, (for though he is the King's uncle, and a member of this present Government,) he would willingly add to our information about his own country, but unfortunately, he is obliged to be very cautious in his intercourse with us. Indeed the manner in which the Images were sent shews this. Mr. Sarkies, to whom the Prince intrusted the dispatch to me of the Images, first proposed forwarding them through Mr. Browne, but after the departure from Rangoon of the King and Court, and finding a person, an Armenian countryman of his own, to whom he could trust, he sent them to me with a note from himself, and a memorandum from the Prince.

Mr. SARKIES writes,

"While the Prince of Mekhara was here, he gave me two ancient Idols, which he ordered me to send to you, and which I now accordingly beg to forward by Mr. Catchatoor. The object of so doing is to inform you, that this kind of Idol has been also found in various parts of the world at different times. He hopes they will serve you as a curiosity."

The Prince's Memorandum is to the effect, that "the Images are the same as those found by Captain Hannay at Tagoung Myo, the inscription the same also in old Deva Nagari characters, and that they must be at least 1800 years old."

I have just received them, and will make enquiries as to the localities where they were found, as Mr. Browne mentions a number of the same description were taken up. Rangoon is the site of an old city, and we may be able to trace some connexion between its foundation and that of the old city of Tagoung.

You will find an account of the Tagoung Images in the vol. of the *Journal of the Asiatic Society*, for 1836, page 157. I never saw the images therein referred to, but conclude they are with the Society.

Should you think fit to notice the subject in the Journal, perhaps the less prominently the Prince is brought forward the better. We are certainly much indebted to him for sending them.

Yours ever sincerely,

W. MACLEOD.

P. S. I got a vol. of the English and Burmese Dictionary for him from Bayley, but if you have any at the disposal of the Society to spare, I am certain he would esteem it a favour if you would present him with one. The copy he has, in that case I fancy he would place at the disposal of the King.

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MY DEAR TORRENS,

Since writing to you with the Image, I found a Plate of the one brought down by Captain Hannay, in the *Journal*; it differs from the one I sent you. The principal image in Captain H.'s is supported by two figures, whereas the Rangoon one has two Pagodas. The Mekhara Prince in his note mentioned, that those he sent me resembled some Dr. Bayfield brought down from Tagoung, but never having heard of these, I erroneously supposed His Highness had confounded Dr. Bayfield with Captain Hannay; but Dr. Richardson has put me to right. Both Dr. B. and Captain H. visited Tagoung, and both appear to have found images with the Deva Nagari inscription, though Captain Hannay's discovery only has been recorded.

I have not been able to hear any thing further on the subject.

Yours very sincerely,

W. MACLEOD.

Moulmein, 10th March, 1842.

The Image referred to, has been received, and placed in the Museum.

Read letter of 23rd March 1842, to Secretary to the Military Board from Captain G. B. TREMENEERE, forwarding some concluding Remarks by him on his report on the Tin Grounds of Mergui.

Read letter from Mr. Secretary BUSHBY of 9th March last, forwarding Correspondence containing information on the Nurma Cotton Ground in Guzerat.

Read letter from Lieut. Colonel A. SPIERS, Resident at Gwalior, of 25th March last, and enclosures on the subject of the Nurma Cotton Ground in Gwalior.

Read the following papers by Captain R. SHORTREDE, First Assistant, Grand Trigonometrical Survey ; viz.

On the calculation of Barometric Heights with Tables.

Remarks on some of the disturbing causes in Barometric Observations.

Remarks on an Inscription of a Magic Square, copied from an old temple in the hill fort of Gwalior.

The Secretary intimated that the subjects of the foregoing papers would be noticed by him in early numbers of the Journal.

Read letter of 9th April 1842, from Lieut. Baird Smith of Engineers, forwarding a " Note on the recent Earthquakes on the North-western Frontier." Lieut. Smith writes, " My object being to attract attention to these interesting occurrences, " and to secure some more methodical and carefully detailed information relative to " their various phenomena than we have hitherto had." The " Note" referred to, the Secretary intimated would be published in an early number of the Journal.

Read following Letter of 16th April 1842, from Dr. A. CAMPBELL, of Darjeeling.

*Darjeeling, April 16, 1842.*

MY DEAR TORRENS,

I had not time to make a memorandum for the Society of the last hours of De Körös, but in my report to Government, forwarded this day, you will find almost all I could have said. You can readily get it from Bushby's office, and make any use of it you think necessary. It concerns you to look after the bequeathment of Rs. 5,000. I hope the Society will not think me an unworthy member for not having furnished you with a report, but to have attempted one formally, and for a learned Society, would have led to the notion that I believed myself capable, from a knowledge of the pursuits of the deceased, to do justice to his merits. Whereas in my official report to Government, this is not looked for, and still it may serve to communicate some interesting particulars to the world and his friends. I hope the Society will erect a monument over him. Here we would subscribe to it. What a pity it is that he did not die near Hodgson!

Yours, &c.

A. CAMPBELL.

The Official Report referred to by Dr. CAMPBELL, has been forwarded by Mr. Secretary BUSHBY, for the information of the Society, and will appear in an early number of the Journal.

The report having been read, it was proposed by the President, and seconded by Colonel H. BURNBY—That the Society record its deep regret at the death of this most able and eminent philologist and enterprising traveller, the loss of whose services in the exploration of countries so little known as Thibet, and its circumjacent regions, and in the elucidation of historical and philological questions, connected with the races which inhabit those interesting and almost unknown tracts, may be looked upon as a calamity to be deplored by the learned world of Europe, and that the sum of Co's. Rupees One Thousand be placed at the disposal of Dr. A. CAMPBELL, for the erection of a Monument, adding thereto a Tombstone, with suitable inscription to the memory of the deceased.

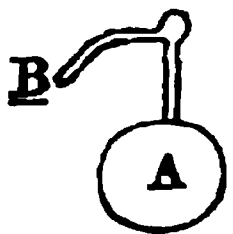
Read a letter of 12th April 1842, from Mr. G. T. LUSHINGTON, intimating that he had on that day “forwarded another specimen for the Society's Museum, which I hope and believe will prove acceptable. It is the Skin of a Fox brought down by the Jowalier Bhotias this year, from the vicinity of the great Himalayan Chain. The fur is, in my opinion, and indeed in that of all who have seen it, very beautiful, and as it seems to have been well preserved, I hope your Curator will be able to make a good job of it.”

“I do not know whether you have any other specimen in the Museum, but think it not likely that you have one, unless HODGSON may have sent one from Katmandhoo. The under-hair of the animal is something like that of the Shawl Goat in fineness of texture. Its *habitat* may be said to be the lofty mountains of Jowalier and other Bhote Mehals, in the vicinity of the eternal snows.”

“I have another article ready for you, but want to know whether it is worth sending. If you already have it, of course it is not worth the carriage, but if it is new to you, I think it will be prized.

“It is the Steam Blow-pipe used by the Sonars of Almora, and other parts of the hills. It is of copper, about five inches in height, and of this shape.

“The globe A being first slightly heated, the nozzle B is inserted into a cupful of cold water, which it rapidly sucks up, thus filling itself. It is then placed in a brazier, and the steam formed by the boiling water contained in the globe is expelled at the nozzle



"B with considerable force, and thus produces a continued and powerful  
"blast.

"The people here say it came from "Cheen"—and believe one of the Nepalese  
"Soobahs first introduced it, about forty or fifty years ago. The curious part of it, I  
"fancy, is the distinct application of Steam to one art so many years ago, among a  
"people so utterly devoid of mechanical knowledge in other matters as our hill  
"men are."

The specimen has been received, and placed in the Museum, being previously  
mounted.

Read letter of 18th April 1842, from Lieutenant J. BROCKMAN, H. M. 80th  
Regiment, presenting two Tartar Bows, &c. Quiver of Arrows taken at Amoy,  
also a kind of Sword taken at Chinhæ.

The Secretary submitted to the Meeting private Seals and Seals of Office found in  
the house of the principal Mandarins of Amoy at the taking of that place; a  
Silken Belt, a Chinese Soldier's Uniform with the name and number of his corps on  
breast and back, taken at Ningpo from the Chinese Arsenal, and a curious Under-  
Shirt for wearing next the skin in hot weather, taken at the storming of Chinhæ.

The whole presented by Mr. Dalrymple of the C. S. to whom the best thanks of  
the Society were voted.

The Secretary at the same time presented a Standard Colour of a Chinese Marine  
Regiment, and a Sword taken at the storming of the Bogue forts in China.

The following list of specimens were presented by Colonel H. BURNEY :—

An Echinite, from Jebel Jaise, near Cairo.

Specimen of a portion of the stem of a Fossil Palm, and samples of fossil exogen-  
ous wood, from the petrified forest near Cairo.

Ditto of Limestone, of which the great Pyramid is built.

Ditto of close Stalagmitic Limestone, whereof the splendid mosque now building  
by Mehemet Ali is constructed.

Ditto of the coarser of two kinds of Granite met with in the vicinity of the  
Pyramids, and of which some of the latter are partly constructed, together with  
various Sarcophagi.

Read petition of 2nd May 1842, from Sree Ram Govinda Sormona, praying to  
be presented with the last vol. of the Mahabharut for correcting the proof sheets of  
Sanskrit Books. The presentation ordered.

Read letter of 28th April 1842, from Lieutenant A. CUNNINGHAM, intimating that he was "busy with a very long article on the Coins of Kashmere. Fourteen plates are now finished, and the fifteenth is now being lithographed. A supplementary plate must be added to contain the coins of various new, besides some curious types of known, kings, and the last plate will be one of Monograms, so arranged as to shew at a glance the names of all the kings who used any one Monogram, and all the Monograms which any one king used."

Read letter of 14th April 1842, from Dr. T. A. WISE, assenting to the proposal of printing his Commentaries on the ancient Hindoo System of Medicine.

Read Mr. LOVELL REEVES' letter to Mr. BLYTH, requesting proposal for the purchase of his book, (Systematic Conchology,) by the Asiatic Society. Ordered, that two copies (with colored plates,) of the work be subscribed for the Library of the Society.

The Curator read his Report for the month of April 1842, as follows :—

SIR,—I have the pleasure on this occasion to congratulate the Society on the variety of presentations made for their Museum during the past month, and on the number of different persons who have thus contributed to its enrichment. These donations have principally consisted of Mammalia, Birds, and Shells, with a valuable box of Insects from Afghanistan, and are as follow :—

#### MAMMALIA.

From Dr. PEARSON, the Society has received a number of skins, but unfortunately not prepared for being mounted, which are referrible to the following species :

*Ursus Tibetanus*, the Black Bear of the Himalaya, figured by Mons. F. Cuvier.

*Cervus (Styloceros) Muntjac*, v. *Ratwa* of Hodgson: the *Kakur*, or Barking Deer of sportsmen.

*C. (Rusa) Hippelaphus*: the Sambur, adult and young.

*Næmorhædus Thar*, Hodgson: two skins of males.

*Bos (Bison) grunniens*: the Yak, a particularly fine skin.

*B. (Taurus) Gaurus*, v. *Bibos cavifrons*, Hodgson, and *Bos aculeatus*, Wagler: the Gaour; a very large skin, from Arracan. The Gaour, I may remark, ranges southward into the Malay Peninsula, from which locality there is a horn of this species in the Museum of the Hon. Company in London: the dimensions of one killed on the Keddah Coast, with a figure of the head, are given in the Royal Asiatic Society's Journal, III. 50; and there is a skull of a female, understood to be from the South of China, in the London United Service Museum. Dr. Helfer states that, in Tenasserim, "the great *Bos Gaurus* is rather rare, but *Bison Guodus*\* very common; besides another small kind of Cow, called by the Burmese *F'hain*, of which I saw foot-prints, but never the living animal." *J. A. S.*, VII. 860. Of this latter more presently. In

\* Evidently a misprint for *Gavæus*, the Gayal; for the words may be written to look very much alike.

the Indian Peninsula, the Gaour inhabits all the extensive forest tracts from the Himalaya to Cape Comorin, and there can be little or no doubt that the *Gnavaera* of Ceylon, noticed by Knox, refers to the same species. Major Forbes, in his recently published 'Journal of Eleven Years' Residence' in that Island (II. 159), informs us that it has been extirpated in Ceylon for more than half a century. A correspondent of the 'Bengal Sporting Magazine,' (for 1835, 217,) writing from the southern Mahratta country, remarks, that "the Bison of this jungle differs materially from those of the Mahabuleshwer hills. The latter is merely a blue Cow of the colour of a Buffalo, but of large size. The regular Bison of Dandelly is a tremendous animal, its highest point being the shoulder." From this it might be inferred, that the North-western animal had not the same elevated spinal ridge; but I am little inclined to suspect that they are different, the more especially as I find the following passage in the 'Transactions of the Agricultural and Horticultural Society of India,' VII. 112. "The only wild cattle we have," observes the writer, J. Little, Esq. "is the *Gowha* of the natives (*Bos Gaurus*). This animal is found in the dense jungles, along the whole range of the Western Ghauts from Assurghur to Cape Comorin. A male was shot at the convalescent station of Mahablesher, near the source of the Kristna, which measured at the shoulder fully seventeen hands high." I have credible information of a Gaour which stood not less than nineteen hands in vertical height. That the Gaour varies much in size, I can assert from personal observation of about forty skulls of this species\*: one of an adult male taken to England, by the late Honorary Curator of this Society, Dr. Evans, is quite a pigmy in comparison with the enormous head in the United Service Museum. A head of a female, with the skin on, in that of the Hon. East India Company, was presented by the late Major-General Hardwicke, as the *As'l* or *Asseel Gayal* of that naturalist, (who figures it in one of the volumes of the 'Zoological Journal,') and of Dr. McCrae ('Asiatic Researches,' VIII. 495). The latter author speaks of it as the *Seloi* of the Cucis, or Kookies, and *P'hany* of the Mags and Burmahs; which last name is doubtless identical with the *F'hain* of Dr. Helfer, applied to another species.

In the passage I have already quoted from Dr. Helfer's list of Tenasserim animals, three species of this group are mentioned, the second of which I conclude to be the Gayal (*B. frontalis*, Lambert, Lin. Trans. VII. 57 and 302, v. *B. Gaurus*, Colebrooke, 'Asiatic Researches,' VIII. 487, v. *B. Sylhetanus*, Duvauzel, F. Cuv. *Mammal*), which Baron Cuvier strangely suggests to be a breed between the common Ox and Buffalo ('Régne Animal,' I. 280, and again in his 'Ossements Fossiles'), but which is a genuine species, of which splendid living examples were, not long ago, in the park at Barrackpore, perfectly tame and gentle. This animal has never been found to the westward of the Boorampooter, and its skull has lately been figured by Mr. Hodgson (Journ. As. Soc. 1841, 470). I am unaware that any trace of it exists in any Museum.

Another very fine species of this group is the Banteng of Java and Borneo (*Bos Sondaicus*, Muller, *B. Bentinger*, Temminck, and *B. leucoprymnus*, Quoy and Gay-

\* In London alone, there are specimens in the British Museum, that of the Hon. East India Company, of the Zoological Society, Royal Asiatic Society, Royal College of Surgeons, London University, King's College, the United Service Museum, besides many in private collections, as that of Professor Bell, Mr. Blofeld of Middle Row, Holborn, &c.

mard), though, as regards the last, I have the authority of Dr. Schlegel of Amsterdam for asserting, that the individual described by these naturalists was a hybrid between the Banteng and the domestic species, such as are very commonly produced in Java, and especially in the Island of Bali, being trained there for domestic purposes. Sir Stamford Raffles notices, in his 'History of Java' (I. III), that "the degenerate domestic cows [of that island,] are sometimes driven into the forest to couple with the wild Banteng, for the sake of improving the breed"; and in Moor's 'Notices of the Indian Archipelago,' p. 95, we are informed that, in Bali, "the breed of cattle is extremely fine, almost every one of these beasts being fat, plump, and good looking; you seldom, if ever, see a poor cow in Bali: it is a breed of a much larger size than the common run of cattle in Java, and is obtained from a cross from the Wild Cow, with the same animal; they are generally of a red colour, and all of them are white between the hind legs, and about the rump, so that I do not recollect seeing one that was not white-breeched. The people have no land expressly devoted to grazing, but let their cattle eat the old stubble, or fresh grass of the rice-fields, after the crops have been taken off; and while the grass is growing, they let the cattle stray into the commons, and woods, and pick up what they can get by the road-side. The rude plough is drawn by two oxen abreast, which the ploughman drives with one hand, while he guides the plough with the other." There is a figure of a hybrid half-Banteng Javanese Cow in the collection of drawings bequeathed by the late Major-General Hardwicke to the British Museum, and of which I possess a rough copy.

The colour of the pure Banteng is similar to that of the Gaour and Gayal, or earthy-brown passing into black, with the four limbs white from the mid-joint downward, in addition to which this species has constantly a large oval white patch on each buttock, whence the name *leucoprymnus* bestowed by M. M. Quoy and Gaymard. Sir Stamford Raffles mentions, that "a remarkable change takes place in the appearance of this animal after castration, the colour in a few months becoming invariably red" (*Hist. Java*, I. III). Its frontal ridge has little tendency to become elevated; and the following is a description of the finer of two frontlets of the male in the Museum of this Society, presented by Prince William Henry of the Netherlands (vide J. A. S. VI. 987). Horns very rugous at base, flattened as in the Gaour and Gayal, but in a less degree, and somewhat similar in flexure to those of the Gaour, though approaching more in this respect to those of the Cape Buffalo, of a black colour, and twenty inches and a half long over the curve, fourteen and a half round at base, their widest portion thirty-five inches apart measuring outside, and tips returning to twenty-seven inches; at base they are six inches asunder across the vertex, widening anteriorly. According to Dr. Solomon Muller, "the Banteng is found in Java in territories which are seldom visited by man, as well in the forests of the plains and of the coast, as in those of the mountains, where it is pretty common. We have likewise seen traces of it in Borneo, and have even received a calf from the Dujaks about a month old. According to Raffles it is also found in Bali; but in Sumatra it does not appear to exist." Sir Stamford Raffles states, that "it is found chiefly in the forests eastward of Pasáma, and in Bali, though it also occurs in other parts of Java."

To the same distinguished statesman, we are indebted for the following piece of information respecting the domestic cattle of Sumatra:—"There is a very fine breed of cattle peculiar to Sumatra, of which I saw abundance in Menangkabu when I



visited the capital of that country in 1818. They are short, compact, well-made animals, without a hump, and almost without exception of a light fawn-colour relieved with white. The eyes are large and fringed with long white lashes. The legs are delicate and well-shaped. Among all that I saw I did not observe any that were not in excellent condition, in which respect they formed a striking contrast to the cattle generally met with in India. They are universally used in agriculture, and are perfectly domesticated. This breed appears to be quite distinct from the Banteng of Java and the more eastern Islands.”—(*Lin. Trans.* XIII. 267.)

It is, I suspect, no other than a domesticated race of the “Wild Ox” of Burmah; an evident species, of which abundant notices may be found in various works, but no satisfactory description. A skull of such an animal, but unfortunately deprived of the horns, and which is very distinct in form from that of either of the foregoing species, exists in the London United Service Museum, and is labelled “Bison, from the Keddah Coast.” I possess some very carefully prepared drawings of this specimen. Captain Gason, of Her Majesty’s 62nd Regiment, who has himself been at the death of a Burmese wild bull, has favored me with the following particulars concerning this species:—“These animals stand about fifteen hands and a half high, are very game-looking, with a heavy body, but fine limbs. Their colour is bright yellowish-buff with a black line from the vertex to the tail, the legs black in front, the tips of the ears, muzzle, and tail-tip also black, and the belly perfectly white. There is little or no difference of colour between the sexes. The horns are cylindrical, rather long, and curve round in front to point towards each other. They are excessively timid, and are generally seen feeding in the valleys, often about a large tank.” Captain Gason observed them at a place called Nathongzoo, about 250 miles eastward of Moulmein. “

This is doubtless the species which is also mentioned in one of Colonel Hamilton Smith’s letters to me, as a “Wild Ox, inhabiting to the eastward of the Boorampooter, and very different from the Gaour and Gayal. It is simply described,” writes Colonel Smith, “as a fine-limbed and deer-like animal of great size, and of a bright bay colour, exceedingly like a Devonshire Ox, very active, fleet, shy, and watchful; living in small herds in the wooded valleys, with watchers on the look out, who utter a shrill warning sound on the least alarm, when the whole dash through the jungle with irresistible impetuosity.” He elsewhere mentions their having white horns; and in Pennant’s ‘Hindostan,’ I remember a notice of a wild species with white horns occurring somewhere further to the Eastward; this same work containing also the earliest mention of the Banteng of Java.

In a late number of the ‘Bengal Sporting Magazine,’ (for 1841, p. 444,) we are informed, respecting the Burmese Wild Cow, or ‘*Sine Bar*,’ that “herds of thirty and forty frequent the open forest jungles [of the Tenasserim Provinces.] They are noble-looking animals, with short curved horns, that admit of a beautiful polish. The cows are red and white, and the bulls of a bluish colour. They are very timid, and not dangerous to approach. Their flesh is excellent. They are the only cows indigenous to the provinces:” yet the preceding paragraph mentions—“The Bison” (Gaour) as attaining a great size in the East.

One more quotation *apropos* to the foregoing observations, and I shall have done. Mr. Crawford informs us, that “The Ox is found wild in the Siamese forests, and

exists very generally in the domestic state, particularly in the southern provinces. Those we saw about the capital were short-limbed, compactly made, and often without horns, being never of the white or grey color so prevalent among the cattle of Hindostan. They also want the hump over the shoulders which characterizes the latter. They are used only in agricultural labour, for their milk is too trifling in quantity to be useful, and the slaughter of them, publicly at least, is forbidden even to strangers. Hence, during our stay, our servants were obliged to go three or four miles out of town, and to slaughter the animals at night. The wild cattle, for the protection of religion does not extend to them, are shot by professed hunters on account of their hides, horns, bones, and flesh, which last, after being converted into jerked beef, forms an article of commerce with China."—*Mission to Siam and Cochin China*, page 431.\*

From Dr. Wallich, the Society has received another specimen of *Paradoxurus typus*, recent.

From P. Homphrey, Esq., a recent young specimen of *Pteromys Oral*, Tickell, procured at Midnapore.

From T. H. Maddock, Esq., Secretary to Government, four heads of Rhinoceroses, from Tenasserim; two of them belonging to the common Indian species (*Rh. Indicus*), and the others to the oriental double-horned Rhinoceros (*Rh. Sumatrensis*). The fact of all three of the Asiatic species of this genus inhabiting the Tenasserim Provinces was first made known in Dr. Helfer's list of the animal productions of that region, published in *J. A. S.* VII. 860; and that "a double-horned Rhinoceros is said to have been seen by the natives in the neighbourhood of Ye," is stated in the 'Bengal Sporting Magazine' for August, 1841; where, however, it would accordingly appear to be much rarer than the single-horned, "of which latter several have been shot by Europeans. They frequent the large jungles to the Eastward, but are more often met with in the jungles South of Ye." According to Dr. Helfer, it would, on the contrary, appear, that the double-horned is the prevalent species in that range of territory. "The *Rh. Indicus*," he informs us, "is found in the northern parts of the provinces, in that high range of mountains bordering on Zimmay, called the Elephant's-tail Mountains; the *Rh. Sondaicus* occupies the southernmost parts; while the *Rh. Sumatrensis*, or double-horned species, is to be found throughout the

\* It is difficult to comprehend what animal can be meant by the Gyal of Bishop Heber's *Journal*, briefly noticed, and very rudely figured, as having been seen by that prelate in the Governor's Park in Ceylon; and equally difficult to understand what the following passage alludes to, in Mrs. Graham's work. At the Governor's house in Ceylon, this lady "saw, feeding by himself, an animal no less beautiful than terrible,—the wild bull, whose milk-white hide is adorned with a black flowing mane." Let me mention here, also, that there is a wild race inhabiting Madagascar that merits investigation. In Mr. Ellis's History of that Island, we read, that—"horned cattle are numerous, both tame and wild: many of the latter resemble, in shape and size, the cattle of Europe," whereas the domestic are all humped like those of India. Pennant notices this wild Madagascar race by the name of *Boury*. There is also some animal bearing the appellation of "Wild Cow," which is met with in herds on the route from Agra to Barielly; and there are many wild humped cattle, of the common Indian species, said to be merely the descendants of domestic individuals, found in herds in certain of the jungles of the province of Oude, which are extremely shy and difficult of approach, and are of some interest as solving the problem in the affirmative as to whether the Zebu could maintain itself wild in regions inhabited by the Tiger (*vide Journal of the Asiatic Society*, IX. 623, and *Transactions of the Agricultural and Horticultural Society India*, VII. 112.

extent of the territories from the 17° to 10° of latitude." Now, from what is known of the habits of these animals, it is probable that the *Rh. Sondaicus* will prove to be the principal mountain species, though by no means limited to the mountains. In Java, according to M. Reinwardt, this animal "is found everywhere in the most elevated regions, and ascends, with an astonishing swiftness, even to the highest tops of the mountains" (*vide* 'Edinburgh Philosophical Magazine,' XIII. 34); and Dr. Horsfield notices, that "it prefers high situations, but is not limited to a particular region or climate, its range extending from the level of the ocean to the summits of mountains of considerable elevation.\*\*\* Its retreats are discovered by deeply excavated passages, which it forms along the declivities of mountains and hills. I found these occasionally of great depth and extent." This species is also an inhabitant of Borneo, where it is styled *Bodoḱ*; but, according to Sir Stamford Raffles, ('*Linnean Transactions*,' XII. 269,) it does not appear that a single-horned species inhabits that part of Sumatra with the productions of which he was best acquainted; "and the single horns which are occasionally procured, appear to be merely the larger horns of the two-horned species separated from the small one;" this, however, may be doubted now that the *Rh. Sondaicus* has proved to be common to Java and Tenasserim, and it appears probable, that while the latter only inhabits Java, it will be found to exist together with *Rh. Sumatrensis* in Sumatra, as both of these are said to be found together with the Indian species in Tenasserim. Whether more than one exists in Borneo we have at present no data for forming an opinion, and the discovery of the formerly supposed exclusively insular species on the Burmese mainland, casts a doubt upon which is the Chinese species noticed by Du Halde to inhabit the province of Quangsi, in latitude 25 degrees.

From M. J. Athanass, Esq., the Society has received a head, with the skin on, of the great Jerrow Stag of the Himalaya (*Cervus Aristotelis*), which I exhibit together with a very fine head of the Sambur of India generally (*C. hippelaphus*). On comparison, it is seen that the former is of a lighter colour, with the hairs more conspicuously tipped with pale fulvous or yellowish-brown; but there is little marked difference between the specimens that would induce a suspicion that they appertained to different species, although the Jerrow is somewhat broader in the forehead, and its antlers are more divergent. Had these antlers belonged to a fully mature animal, however, they would have exhibited a size such as is never attained by those of the Sambur; a magnificent pair in the Museum of the Hon'ble Company in London are nearly four feet in length; whereas it is rare that those of the Sambur exceed two feet and a half. This I am enabled to assert with more confidence, since I have examined numerous bales of Stag-antlers imported from this country, in the hope of discovering among them some belonging to new or little known species; but I have invariably found these packages to consist solely of those of the Sambur and spotted Axis, generally in about equal proportion, and have never once thus met with a specimen of a Sambur antler that approached in magnitude to that of an adult Jerrow. Mr. Hodgson has distinguished these species in the Society's Journal, (I. 66,) together with another which I am enabled to state positively is the *C. niger* of Prof. de Blainville (*Bull. des Sc.* 1816), and which is styled by Mr. Hodgson *Rusa Nipalensis*. The latter naturalist has supplied representations of the antlers of all three species, which are published in the Journal of the Asiatic Society, I. 115. "The Nipalese," he remarks,

“distinguish them with reference to the different shades of their, in general, uniform dark colour, by the epithets *Phusro*, *Ráto*, and *Kálo*, or grey, red, and black, *Jarai* [Jerrow.] The *Phusro* is the largest, being not less than a Horse in size; and has his dark hide copiously sprinkled with *phusro* or hoary. The *Ráto* is the next in point of size, and is of a redder hue. The *Kálo* is the smallest, and of a shining clear black. \* \* \* All but the *Kálo* species have a subterminal, as well as a brow antler.” M. Blainville described his *C. niger* from a drawing which he saw at the India House, together with certain other drawings upon which he has founded his *Capra coscus*, *C. imberbis*, &c., and although these drawings could not then be found when I applied to see them some two or three years ago, I have since met with duplicates of them among those of the late Dr. Buchanan Hamilton, in charge of Dr. Wallich, marked, too, as having been (i. e. the originals) delivered at the India House in 1806, and the names are in Dr. Buchanan Hamilton’s own writing which have been adopted by M. Blainville, except that the Goats are better styled *Capra Ægagrus Cossea* and *Ægagrus imberbis*, being clearly and obviously mere varieties of the common domestic species. The colour of *C. niger* (Buchanan Hamilton and Blainville) is represented brownish black, and the antlers, in accordance with Mr. Hodgson’s description, have no subterminal branch or tine; indeed they so nearly resemble the figure in the Society’s Journal, X. 722, that it might be supposed that both were drawn from the same individual.

With respect to the *C. equinus* of Colonel H. Smith, (which is not the Malayan species so denominated by Baron Cuvier,) if it really differ from the Sambur, it is probably the *C. Leschenaultii* of Baron Cuvier (‘Ossements Fossiles’, IV. 32.) I have examined and possess figures of the frontlet of the identical individual described and figured from life by Colonel Smith, which is now preserved in the Museum of the London Royal College of Surgeons. The antlers measure two feet four inches in length, and eight inches round above the burr, with a brow-process fourteen inches long; their widest portion apart is twenty-two inches and a half, the tips returning to twenty inches, and those of the upper tine to fourteen inches; they have a differently granulated surface from ordinary Sambur and Jerrow antlers, being angulated and prickly instead of smooth to the feel, however coarsely tuberculated may be the others; and the tail of the animal is represented in Colonel Smith’s figure to be slender and not bushy, in lieu of presenting that appearance which in the others has been compared to the tail of a docked horse that has been neglected\*; the caudal disk, likewise, would appear to be more conspicuously developed, though it is doubtful whether either of these characters is of constant or normal occurrence: still it is worthy of remark that Colonel Sykes, in his Catalogue of the Mammalia of the Dukhun, (‘Proceedings of the Zoological Society,’ 1831, 104,) considers the large Rusa Stag which “abounds about the ghâts of Dukhun and in Khandesh as no doubt the same as the Malayan Rusa figured in Griffith’s work. It wants the size of the *C. Aristoteli* [*Hippelaphus*] of Bengal, and is not so dark in colour”; and it should be observed that *C. Leschenaultii* of Cuvier was received from the Coromandel Coast. But Mr. Walter Elliot, in his recent Catalogue of Mammalia in the Southern Mahratta Country, (‘Madras Journal,’ No. XXV, 220), asserts, that “there is only one species of

\* This difference might depend, however, upon the animal being then, perhaps, shedding its coat.

*Rusa* found in the western forests, which is common also to all the heavy jungles of Southern India." None of the descriptions given by Hamilton Smith to the different Indian species under the names of *Hippelaphus*, *Aristotelis*, *Equinus*, apply exactly to it, but I have little doubt that all three are varieties of the great Indian Stag referred to *Hippelaphus* of Aristotle by M. Duvaucel, and to which it is not improbable that the *C. unicolor*, or *Goda* of Ceylon, is likewise referrible, &c." For my own part, I had an opportunity of examining several pairs of antlers of the peninsular animal while at Madras, and I considered them to be genuine Sambur, and I much incline to agree with Mr. Elliot in the opinion that there is probably but this one species of the group inhabiting Peninsular India, though it is quite certain that there are two others in the northern hills, as was first satisfactorily shewn by Mr. Hodgson.

From Lieutenant Tickell, a highly interesting collection has been received of specimens procured at Chyebama; viz.

*Chiroptera*: Twelve skins, referrible to five species; viz. a *Rhinolophus*, two specimens; *Vespertilio pictus*, four specimens\*; another and much larger species, allied in its colour and markings to the preceding, but very different in the quality of its fur, three specimens; a small dark species, apparently the same as is very common about Calcutta, two specimens; and a beautiful *Scotophilus*, of a bright golden fulvous colour on the under-parts, one specimen. These I shall endeavour to determine as I find leisure to undertake the task, but the descriptions to which I have access are, for the most part, too meagre to permit of arriving at satisfactory conclusions from them.

*Pteromys Oral*, Tickell: five specimens; suggested by me on former occasions to be identical with *Pt. petaurista*, to which it is very nearly allied; but its size is inferior, and colour comparatively devoid of any rufous tinge. On comparing the skull, that of *Oral* is shorter and smaller, with the superior orbital margin and post-orbital process conspicuously less developed, the upper rodential tusks are directed more abruptly downwards, and the series of grinders are more than proportionally smaller. I have had the skulls prepared of both the adult and young *Pt. Oral*.

*Cervus (Stylloceros) Muntjac*: a nearly grown female.

*C. (Rusa) Hippelaphus*: skin of a fine male, prepared for stuffing; but unfortunately too much injured by insects to be available for the purpose. The head of this specimen has already been noticed, and compared with that of the Himalayan Jerrow.

*Tetraceros chickera*: labelled *Antelope chickera*, and I believe correctly referred to that species of Major General Hardwicke, (*Lin. Trans.* XIV. 520,) though being a young kid, the species is difficult to determine with absolute certainty. The skeleton of the original specimen described by Hardwicke, and beautifully figured from life by Hill, is deposited in the rich Museum of the London Royal College of Surgeons: as often happens with captive sheath-horned ruminants, the blunt-tipped superficial sheathing which temporarily invests the harder permanent sheath of the horns of the young animal, had been retained in this adult specimen, which Dr. Leach not understanding, he was led to consider as belonging to a different species, the frontlet of a wild-shot specimen in the same collection, which he has styled *T. striaticornis*. A true second four-horned species, however, has been described by Walter Elliot, Esq.,

\* This occurs in the neighbourhood of Calcutta. —E. B.

(‘Madras Journal,’ No. XXV. 225), as *Ant. subquadricornatus*, being characterized by larger size, and by having the anterior pair of horns scarcely developed, while the posterior pair is longer than in the preceding species. Both of these animals were known to me in England. The name *Chickera*, according to Mr. Elliot, is applied by all natives to the *Gasella Cora* of Colonel Hamilton Smith, which I have the authority of that learned naturalist for identifying with *Ant. Bennettii* of Sykes, rightly referred by Mr. Elliot to *A. Arabica* of Hemprich and Ehrenberg; though Colonel Smith’s appellation takes precedence. The Museum of this Society contains a stuffed specimen of the kid of *G. Cora*, and numerous heads of adults; and I have seen many fine examples of the species, and among them a pair now living in Calcutta: nor is this the only species of true Gazelle inhabiting India. Mr. Gray has described, or at least named, a *Gasella Christii*, founded on a pair of horns obtained, if I remember rightly, in the Thurr, or great sandy desert north of Cutch, and deposited in the British Museum; and there is a stuffed specimen of the same species in the United Service Museum, received from Bombay, which satisfactorily establishes its existence. The *G. Christii* is a typical *Gasella*, inferior to *G. Dorcas* in size, and remarkable for its very pale colouring; the horns are smaller and much more slender than in *G. Cora*, less freely thrown out, and take the usual curve backward in this group, having the tips very abruptly bent inward. Proceeding westward, another species, the *G. subgutturosa*, inhabits Persia and the foot of the Caucasus; while *G. Dorcas* is found in Arabia in addition to *G. Cora*.

Respecting the present species, or *Tetracerus chickera*, a writer in the ‘Beagal Sporting Magazine’ mentions, that “it is found in the forests at the bottom of the Sivalik hills, and is considered a rare species: as the places it inhabits can only be beaten by Elephants, and this animal generally breaks cover at the distance of eighty yards, bounding off in a succession of short leaps, it is not very easily shot. The back pair of horns are about four inches, and the fore one inch and a half in length. This species,” it is added, “is called *Chouka* or *Chousinga*, while *Chickera* is applied to either *subulata* or *acuticornis*.”

Captain Brown states, in the same periodical, that—“The *Shikara*, a small antelope yet undescribed, is found in Hurriana; both sexes have horns, of a slender form without rings, and about eight inches in length; the animal is about half the size of the common Antelope [*A. Cervicapra*.] There is another Antelope also found in Hurriana, with slightly compressed horns, having rings, bending backward, and ten inches in length: both these species being unknown to naturalists.” The latter is perhaps *Gasella Christii*, and the former doubtless identical with “an elegant small-sized Antelope, with horns in the females, numerous about Delhi;” as noticed by another observer in the same work.

These diminutive Antelopes of India are greatly in need of elucidation. In the Royal College of Surgeons, London, there exists a frontlet from this country, to which Prof. Blainville has assigned the name of *Ant. subulata*, and a single horn of another species, which he has designated *A. acuticornis*. These are described in Colonel Hamilton Smith’s valuable treatise on the *Ruminantia*, published in the 4th volume of Griffith’s English edition of Cuvier’s ‘Animal Kingdom,’ and I possess original drawings of both specimens, which I shall take an opportunity of publishing in the Society’s Journal.

*Bos Gaurus*.—The specimen prepared for mounting, as noticed in my last monthly Report to the Society, has since arrived, in a condition sufficiently uninjured to render it probable that we shall be able to set it up,—an undertaking which is now in progress.\* The only portions injured are the forehead, which unfortunately has been partly denuded of its hair, and the back of the neck, which latter will however not be very observable in the stuffed specimen. If we succeed to my anticipations in mounting this enormous animal, it will certainly form a highly attractive object in the Society's Museum, and it will be the first example of the species which has been thus set up in any collection, as our skeleton of the same beast is likewise the first, and I believe still the only one, that any institution can boast of. Our late Honorary Curator, Dr. Evans, took with him, however, two skeletons of female Gaours to England, but had not succeeded in disposing of them when I left that country.

*Manis pentadactyla*, Lin.: a specimen remarkable for the unusual degree to which its hard scales have been worn down, probably from the narrowness of the rocky crevice that may be supposed to have led to its customary retreat, as those of the croup are thus ground away to the greatest extent. Moreover, the animal had lost one of its hind limbs, in consequence of which part of the weight of its body fell on the corresponding side of the tail, so that the series of lateral caudal scales on that side are so much rubbed away, that a sectional view of them is exhibited, wherein the expanded inferior surface no longer exists, and the apical point of each scale is considerably above and extends laterally beyond the side-angle. The general colour of this specimen is browner, or less glaucous, than is usual in the species.

Our Museum contains two other strongly characterized species of (presumed) Oriental Pangolin, of which one is, I suspect, undescribed.

For a long while, two species only were generally recognised of this genus,—the Long-tailed and Short-tailed Pangolins, or *Manis tetradactyla* and *M. pentadactyla*, Auctorum, which Cuvier was the first to refer distinctly to the continents of Asia and Africa respectively. The judicious Pennant, however, in the last edition of his 'Quadrupeds,' referred to an animal killed in Tranquebar, as described and figured in the 60th Volume of the 'Philosophical Transactions,' as probably representing a distinct species, which I think there can be no reasonable doubt of. M. Desmoulins has also described one, in his 'Mammalogie,' as *M. Javanica*: and the Cape species has been distinguished by Mr. Smuts, in the 'South African Journal,' as *M. Temminckii*, since more fully described and compared with its then known congeners by the late accomplished Secretary to the Zoological Society, Mr. Bennett, in the 'Proceedings of the Zoological Society', 1834, 81. Mr. Hodgson, next, described the Nepalese species as distinct from the currently admitted Indian one, by the appellation *M. auritus*, in the Journal of this Society, V. 234; but it is clear that he misapprehended the meaning of the description of the Indian species in Griffith's Catalogue, where the expression "eleven longitudinal series" of scales is intended to signify the central and successive lateral ranges, counting obliquely down each side of the body. The identification of Mr. Hodgson's alleged species with the ordinary Short-tailed Pangolin, Auctorum, has already been announced by Mr. Ogilby, in the Zoological Memoir annexed to Dr. Royle's 'Illustrations of the Botany, &c. of the Himalaya

\* And which has succeeded beyond expectation.—E. B.



Mountains'. Unquestionably, it is the species described as *Manis pentadactyla* in Shaw's 'Zoology,' I. 81, and it is as clearly the *Manis Indica*, v. *pentadactyla*, Lin. of M. Lesson, in the *Dict. Class. d'Hist. Nat.*, where the following synonyms are appended; *M. brachyura*, Erxl., *M. macroura*, Desm., and *M. crassicaudata*, Geoffroy: but the "Pangolin" of Buffon (*Hist. Nat.*, X. 187, pl. XXXIV), as distinguished from his "Phatagen," is obviously a distinct species from any now recognised; and the passage which that illustrious naturalist quotes from the traveller Desmarchaia, and which has been copied by every subsequent writer on this genus, descriptive of a species called *Quogelo* by the Negroes of Guinea, which is said to attain to eight feet in length, of which the tail measures four, very clearly denotes another species of Pangolin as yet unknown to modern cultivators of Zoology. The differences of Buffon's "Pangolin" from the ordinary species of this country, is noticed in the first volume of the 'Asiatic Researches' (p. 376), where a figure is given of the Indian animal, and there is a notice of its anatomy in the second volume of the same work (p. 353), but containing no details elucidative of specific distinctions. Dr. Cantor informs me, that the geographic range of this species extends eastward to Chusan; and Pennant quotes Dahlman (in *Act. Stockh.* 1749, 265), noting its existence in China, where it is termed *Chin Chian Seick*, and also mentions its occurrence in Formosa. In Assam I have been informed that there are Pangolins of very large size, in all probability a distinct species: and from the same region a still more interesting species of edentate animal may be looked for by zoologists.

With these preparatory observations, I now proceed to notice a species which appears, so far as I can find, to be undescribed; but I regret to add that I have been unable to learn its native locality. It approaches very near to the "Phatagen" of Buffon, or Long-tailed Pangolin of Africa, but has the tail considerably less elongated than in that species, though more so than in any other known to systematic Zoology. I shall designate it *Manis leptura*. Length of the specimen thirty-nine inches, of which the tail measures eighteen, and the head four; on each foot are five claws, the innermost on the fore-feet minute: although considerably larger than two specimens before me, which I refer to *M. Javanica*, the claws on its fore-feet are smaller and more curved, while those on the hinder are longer: in (presumed) *Javanica*, the middle fore-claw, though worn at the tip, measures fully an inch and three-quarters, and the next externally one inch and three-eighths; whereas the corresponding measurements in the new species are one inch three-eighths, and one inch: but on the hind foot, the middle claw of *Javanica* scarcely exceeds three-quarters of an inch, and the next externally is under five-eighths of an inch; while in the new species these measure, respectively, an inch and a quarter, and one inch: following out the comparison, the head of *leptura* is considerably more slender and elongated, measuring two inches and three-eighths from eye to snout, and having no trace of ear-conch; in *Javanica* there is a distinct ear-conch, and the distance from eye to snout is but an inch and five-eighths; the animal, however, being considerably smaller, though not in that proportion. In *Javanica*, the scales upon every part are comparatively uniform in size, and there is no abruptly marked difference of dimensions between those of the head and neck; in the new species, as in *pentadactyla*, those of the head are very much smaller: in the former, the lateral scales of the body are strongly carinated, while in the latter they are but very slightly so indeed: the scales on the fore-limbs are much smaller, more nume-



rous, and differently disposed, in the new species from what they are in *Javanica*, appearing as hexagons instead of lying in quincunx order; on the hind-limbs the same diversity exists, but is less strongly marked. Protruding from beneath every scale of *Javanica* are seven or eight conspicuous bristles; while in *leptura* one or two only can be discerned here and there, scarcely more than in *pentadactyla*. The number of series of scales consists in *leptura* of nineteen, and in *Javanica* of seventeen; the central row from the occiput to the tail-tip of the former consists of fifty-three, to which may be added ten upon the head. Lastly, the under-parts are less hispid in *leptura* than in *Javanica*, and the tail is both narrower and longer. The general colour of the scales in *leptura* is deep rufous-brown, while those of *Javanica* are blackish-brown, and of *pentadactyla* whitish or glaucous-brown. In the specimen now presented, however, of the latter, as before remarked, the colour of the scales is darker and less glaucous than usual.\*

\* Since the above was written, the extremely interesting account of the ordinary Indian Pangolin, by Lieutenant Tickell, has appeared in the *Journal (ante, p. 221, et seq.)*, and the analogies presented by this animal and the Great Anteater (*Myrmecophaga jubata*) of South America, of which so interesting a notice has been published by M. Schomburgk, (*P. Z. S.* 1839, 24,) are worthy of being studied.

The retention of the *feces* was observed in both instances; and M. Schomburgk supplies us with a hint as to what food the Pangolin may not improbably be maintained upon in captivity. Of an adult *Myrmecophaga*, he writes: "It began to feed on the third day; we gave it ants and farina; the latter, a preparation of cassada root, it never refused. The ant's nests in the neighbourhood were soon exhausted, and more by way of experiment than out of persuasion that the animal would eat it, some small pieces of fresh beef were placed before it; to our greatest astonishment it ate the meat with avidity, and has since been chiefly fed on fresh beef and fish. We observed that in the course of three weeks it evacuated only twice, and then very copiously; this was likewise the case with the young one; and before I noticed the same circumstance with the adult, I thought its death was partly caused by constipation." So, likewise, in Lieutenant Tickell's Pangolin, after it had fasted several days, "there was a quantity of the remains of ants in its stomach, and the rectum was full of *feces*."

The *Myrmecophaga* "secretes a liquid substance, transparent like water, which drops almost constantly out of its nostrils and mouth; this is the more remarkable, as it used very little water." It does not appear that the same was noticed of the Pangolin.

The prodigious strength of both animals is sufficiently attested by the osseous and muscular conformations subservient to its display.

Both raise themselves on the hind legs to reconnoitre; but the *Myrmecophaga* exhibits the more usual structure having reference to this habit, as it possesses plantigrade hind-soles; while the weightiness of the tail may be inferred to afford considerable aid to the Pangolin in enabling it to maintain those remarkable attitudes observed by Lieutenant Tickell. While the latter creature, however, would appear to be wholly incapable of active defence, the former rises on its haunches, and strikes with the sharp claws of one of its fore-feet at its enemy, while the other remains pendent, and only in cases of great danger throws itself on its back, and strikes with both fore-feet, or embraces with its fatal hug. The little two-toed Anteater has likewise been observed to defend itself by striking with one of its fore-limbs.

The very curious little animal last noticed has been ascertained to feed on the nymphæ of arboreal *Hymenoptera*, which it seizes with great address by means of its nipper-like fore-claws; and M. Schomburgk relates, of the Great Anteater, that—"It attempted frequently to take up objects with its paws; in which manœuvre its long claws assisted wonderfully. \* \* \* It climbed up the palings of its pen with great agility, never using both of its arms at a time, but first one and then the other; and if it had taken hold sufficiently with its claws, it raised the whole body, and brought up the hind-feet. We may conclude from this fact upon the strength of the muscles of its fore-limbs. The great muscle of the arm, of one which we dissected, was two inches wide, and three-eighths of an inch thick.

Among the specimens procured in the neighbourhood, I shall only notice *Pachysoma marginatum*, which I find is of common occurrence in this vicinity.

#### AVES.

Lieutenant Tickell's Birds consist of 120 specimens, which are referrible to eighty-one species, twenty-seven of which are new to the Society's Museum, and have enabled me to identify many of those described by Major Franklin and Colonel Sykes, (in the 'Proceedings of the Zoological Society' for 1831 and 1832.) I distinguish such as are new to our Museum by an asterisk.

• *Palæornis Alexandrinus*: female.

*P. torquatus*, ditto.

*Falco luggur*, Jerdon, ditto.

*F. tinnunculus*.

\* *Aquila Vindhiana*,\* Franklin, *P. Z. S.*, 1831, 114.

\* *Spizæus* (Vieillot) *albogularis*, Tickell; genus *Nisæetus*, Hodgson, *J. A. S.*, V. 228. Length twenty-two inches, or rather more, of wing from bend sixteen inches, and tail ten inches; bill over curve (including cere) one inch and three-quarters to forehead, and one inch and five-eighths from point of upper mandible to gape; tars three inches, and feathered to the toes. General colour of the upper parts black, with a shade of brown; the nuchal feathers white at base, and the occipital prolonged to form a crest two inches and a half in length: throat, fore-neck, and breast pure white, the sides of the last having a narrow black central streak to each feather: belly, flanks, under tail-coverts, fore-part of the under-surface of the wings, and plumage of the legs, deep rufous, darkest on the lengthened tibial feathers, and streaked longitudinally with black on the sides, the posterior feathers of which (under the wing) are wholly dusky-black; rest of the wing albescent underneath, the terminal portion of the primaries, beyond the emargination of their inner vanes, barred inferiorly with black, and chiefly on the inner vanes, the outer but very faintly so; and tail brownish above, the central feathers darkest, and albescent like the wings on its under-surface, which

"I have already remarked how fond the young one was of climbing, and this, coupled with what I have just now related, makes me not doubt that, if circumstances should require it, they climb trees in the wild state with the same agility."

The mode of walking upon the knuckles, with the claws bent upwards and inwards to the leg, is common to both genera, though confined to the fore-feet in *Myrmecophaga*, whereof the trenchant claws are however better protected, being received into a groove, while a callous pad projects to increase the surface upon which the animal treads. The fossil genera *Megatherium*, *Megalestis*, and *Cœlodon*, would appear to have advanced on the ground in the same manner as their recent allies the *Myrmecophagæ*, being intermediate to these animals and the Sloths, and especially, it would seem, approximating the diminutive two-toed Anteater; and as this South American group is represented in the Old World by the Pangolins, which likewise have enormous fossil congeners, so the other great American group of Armadilloes, with their huge fossil allies (the *Hoplophoræ*, Lund, vel. *Glyptodon*, Owen, &c.), is represented in Africa by *Orycteropus*; and who shall say, when the fossil treasures of that grand continent shall have been exhumed, what mighty creatures of the past bearing that affinity to the existing *Orycteropus*, which the giant Pangolins and huge *Edentata* buried in other continents do to their existing analogues of the same regions, may once more glory in the light, to uphold the classic fame of Africa as the "land of monsters!"

\* I regret to add that this and several other specimens have since been utterly destroyed by the *Dermeestes*, their skins not having been poisoned, while other and poisoned skins that were with them have totally escaped injury.—E. B.

has a series of narrow dusky bands indistinct on the outermost feathers, and successively more developed to the central; above, these bands are also seen, but obscurely: the ear-coverts are white towards the eye, and elsewhere rufous, each feather having a medial streak of black. "Irides dark; beak leaden-blue, its cere and base wax-yellow; legs yellow, and talons black," the latter large and powerful. The plumage of this fine specimen had been newly renovated, and a few of the old feathers remaining on the wings and among the upper tail-coverts are of a moderately dark brown colour, contrasting with the much darker or blackish hue of what is evidently the livery of maturity.

*Circetus (Hæmatornis, Vigors,) undulatus*, Vigors, *P. Z. S.*, 1831, 170, and figured in Gould's 'Century,' part I: male and female.

*Circus melanoleucos*: marked female, in dress precisely resembling that of the male. This species is not rare near Calcutta.

*C. Swainsonii*, A. Smith, *S. Afr. Journ.* 1831; *C. pallidus*, Sykes, *P. Z. S.*, 1832, 80: female.

*Otus brachyotus.*

*Ninox lugubris*; *Strix lugubris*, Tickell, *J. A. S.*, 11. 572; *Ninox Nipalensis*, Hodgson, *Madras Jl.*, No. XIV. p. 23.

*Athene Indicus*; *Noctua Indica*, Franklin, *P. Z. S.*, 1831; 115; *Strix Brama*, Temminck.

\* *Ath. undulatus*; *Strix undulata*, Tickell, *J. A. S.*, 11. 572. *Ath. erythropterus*, Gould, *P. Z. S.*, 1837, 136; *Noctua perlinaea*, Hodgson: male and female.

*Strix flammea*.

\* *Buceros Malabaricus*: two fine specimens.

\* *B. gingianus*. two adults and a young specimen.

*Coracias Indica*: two specimens.

*Merops viridis*, v. *Indicus*.

\* " *Bucco viridis*, Gmelin; *B. Zeilonicus*, Latham, Brown, *Ill. Zool.* pl. XV.; *Kettorea*, Vieillot; *B. Lathamii*, Vieillot, *Encl. Method.*; *B. caniceps*, Franklin, *P. Z. S.*, 1831, 121." Jerdon, *Madras Jl.* XI. 217.

*B. Indicus*: two specimens.

*Picus (Brachylophus) Bengalensis*: male and female.

\* *P. (Dendrocopus) Mahrattensis*: male.

———— *nanus*, Vigors, *P. Z. S.*, 1831, 172: male.

—— ( *Meiglyptes* ) *badius*: female.

*Centropus pyrrhopterus*: female.

\* *C. lepidus*, Horsfield, *Lin. Trans.* XIII. 180†. Length fourteen inches, of wing six inches and one-eighth, and middle tail feathers seven inches and three-quarters, exceeding the outermost by three inches and seven-eighths; bill to forehead one inch, and to gape one inch and a quarter; tarse one inch and three-quarters; long hind claw an inch one-eighth. General colour dark chestnut-brown above, pale fulvescent underneath, passing into white on the throat and belly; wings principally bright chestnut-rufous, and tail black, more or less rayed across with rufous. The plumage

† I have recognized this species from Dr. McClelland's drawing of an Assamese specimen transmitted to the India House, and referred by Dr. Horsfield to this species; the description above referred to being insufficient for the purpose.

of the upper-parts, to the inter-scapularies and scapularies inclusive, and of the lower parts to the breast inclusive, is of the usual character in this genus, having rigid and pointed shafts, which are yellowish-white, contrasting on the upper parts with a dusky border; while the feathers on the hind-part of the back, rump, and on the belly, are short and downy: scapularies indistinctly barred with dusky, as also the feathers on the sides of the neck and breast, the bars on these being contracted into spots: sides, tibial plumes, and under tail-coverts, fulvescent-white, and more distinctly barred with black. The specimen described is a young male, which had nearly assumed the adult plumage, but has a few feathers of the juvenescent garb remaining; the adult primaries and secondaries are thus shown to be uniform chestnut-rufous, while the immature are barred with black; and the adult tertiaries only differ from the primaries in being tinged with dusky: tail black, with a slight green shine, and tipped with whitish, the uropygials and upper coverts barred with rufous: rump dusky, tipped with rufescent and whitish, and belly pure white. "Irides carmine. Bill light horn: and legs dark leaden-blue."

*Macropteryx longipennis*, Swainson; *Hirundo blecho*, Tem.: male.

*Crypsirina vagabunda*.

*Pastor tristis*.

*P. cinereus*, Jerdon: two specimens.

\**Edolius cærulescens*.

*Lanius Hardwickii*.

*Graucalus Papuensis*; *G. Nipalensis*, Hodgson, 'Indian Review,' I. 327: male and female.

*Pericrocotus (Phænicornis, Sw.) princeps*: a male and two females.

*Muscicapa melanops*, Vigors, *P. Z. S.*, 1831, 171, and figured in Gould's *Century*, plate VI.

*M. cærulea*, Vieillot; *M. occipitalis*, Vigors, *P. Z. S.*, 1831, 97: female, being the *M. cæruleocephala*, Sykes, *P. Z. S.*, 1832, 85.

\**M. picata*, Sykes, *P. Z. S.*, 1832, 85: two males. This species is erroneously identified by Mr. Jerdon with the *M. hirundinacea*, Reinwardt, v. *M. obscura*, Horsfield, *Lin. Trans.* XIII. 146, and figured by him in the 'Zoological Researches in Java'; but the latter is at once distinguished from it by having no white on the wings, nor on the sides of the neck; neither are any of its tail-feathers white-tipped. The African *M. picata* of Swainson was subsequently so named, and must consequently receive another appellation.

\**M. Poonensis*, Sykes, *P. Z. S.* 1832, 85.

\**Muscicapa (?) superciliaris*, Jerdon, *Madras Journal* No. XXVI. 16; *Dimorphus albogularis*, Nobis, *ante*, p. 190.

\**Hirundo filifera*, Stephens; *H. filicaudata*, Franklin, *P. Z. S.*, 1831, 115; *Wire-tailed Swallow* of Latham.

*Ixos jocosus*: male and female.

— *pusillus*; *Hæmatornis (Sw.) pusillus*, Nobis, *Report* for last September, *J. A. S.*, X. 841: male and female.

*Chloropsis aurifrons*, Jardine and Selby; *Chl. cæsmarhynchos*, Tickell, *J. A. S.* II. 577: two specimens marked female, and not differing in plumage from the adult male, further than that there is less yellow surrounding the black of the fore-neck. This handsome species is no despicable songster, and lives and sings well in confinement.

*Iora typhia*; *I. scapularis*, Horsfield; *Motacilla subviridis*, Tickell, *J. A. S.* II. 577.

\**Parus xanthogenys*, Vigors, *P. Z. S.*, 1831, 92, and figured in Gould's 'Century,' pl. XXIX, fig. 1.

\**P. Nipalensis*? Hodgson, *Ind. Rev.* II. 31 (*P. cæsius*, Tickell): two males. This bird agrees minutely with Mr. Hodgson's full description, excepting in being a trifle smaller. Length about five inches, of wing two inches and a half, and tail two inches and a quarter; bill to forehead (through the feathers) seven-sixteenths of an inch, and to gape half an inch; tarse five-eighths of an inch.

\**Dendrophila frontalis*, Swainson.

\**Sitta castaneiventris*, Franklin, *P. Z. S.*, 1831, 121, and figured in Jardine and Selby's 'Illustrations of Ornithology,' pl. CXLV, the beak being represented much too short: male and female; the latter having the under-parts very much paler rufous than in the male. Although I entertain no doubt that this is the species indicated by Major Franklin, still our Museum contains a specimen of another species to which the Latin definition furnished by that gentleman equally applies. This latter is altogether a stouter bird, with the bill especially much broader, and not—as in the other—distinctly and conspicuously compressed for the basal two-thirds: length of wing three inches and one-eighth, and of tail an inch and three-quarters; whereas in the male and female *castaneiventris*, these measurements are respectively three inches and two inches seven-eighths, and an inch and a half. The generic markings and coloration are so similar, that really I do not see how the dry specimens can be further characterized apart; yet a glance suffices to shew their non-identity as species, and the one now indicated is considerably more allied to the British Nuthatch than is the other, which last displays a close affinity with *Dendrophila*, not observable in that with which I am comparing it. With respect to colour, the hues of *castaneiventris* are altogether softer and more delicate, and in both sexes the grey of the upper part of the head and neck is conspicuously paler than that of the back; whereas in the other, although the head and nape are seen, on particular inspection, to be somewhat lighter than the back, this would scarcely be noticed, unless attention were expressly directed to the observation. In *castaneiventris*, the upper tertiaries are uniformly bluish-grey, and in the rest there is no strongly marked distinction between the dusky of the inner web, and the grey external margin; but in the other species, the external blue-grey contrasts abruptly with the black of the internal portion of the feather, which last, too, extends over a considerable part of the outer web, as is not the case in *castaneiventris*: this distinction may perhaps vary somewhat in amount of development in different specimens, but I suspect will always be found to prevail more or less decidedly. In the male *S. castaneiventris*, the colour of the whole under-parts, from the white throat to the mottled under tail-coverts, is of a deep dark ferruginous; while in the female it is not very much darker than in a British Nuthatch, having the fore-neck and breast a sort of dull isabelline hue tinged with ferruginous, and the belly and flanks darker and more deeply tinged with the latter. In the new species (sex unknown), the fore-neck, breast, and lower parts are uniformly coloured, and much paler than in the male *castaneiventris*, but deeper than in the female, being of a dull rusty cinnamon tint, with the throat and beneath the eye white, as in the others. I shall venture to designate this bird *S. cinnamiventris*.

A species is figured and described by Messrs. Jardine and Selby, *Ill. Orn.*, pl. CXLIV, as *S. Himalayensis*, which, if not the same, must be very closely allied to that described by Mr. Hodgson (in *Journ. As. Soc.* V. 779,) as *S. Nipalensis*\*; the latter naturalist also describes an *S. corallina* (*loc. cit.*), which would appear to border closely upon *Dendrophila frontalis*, and there is another *Dendrophila* adverted to by Mr. Swainson as *D. flavipes*, with which I am unacquainted. These are all the Indian species of the present group I as yet know of, and as many as three are now ascertained to inhabit Europe, besides several in North America.

*Oriolus Hodsonii*, v. *Asiatic melanocephalus*: a male in mature plumage, and one in second plumage, or that which succeeds to the nestling garb; this second dress representing the *O. McCoshii*, Tickell, *J. A. S.*, II. 577, and being generally mistaken for the female livery of the species.

*Turdus unicolor*, Gould, *P. Z. S.*, 1837, 136, but not *T. unicolor*, Tickell, *J. A. S.* II. 577; which latter having been first bestowed, it is necessary to rename the present species, which I therefore propose to designate *T. modestus*.

\**T. (Oreocincla, Gould,) parvirostris*, Gould, *P. Z. S.*, 1837, 136: two males.

*Petrocincla Manillensis* (?); *Turdus Manillensis*, Gmelin; *le Merle Solitaire de Manille*, Buffon, *Hist. Nat., Ois.*, II. 363; *P. Pandoo*, Sykes, and the female *P. Maal*, Sykes, *P. Z. S.*, 1832, 87-8. Accordingly, this species would extend to the Phillipines, Tenasserim, and Peninsular India; but I am not yet certain that the Indian bird has ever any rufous on the under-parts. A specimen from Luçonia, which I adjudge to be a young male once moulted, has the whole upper-parts, throat, and breast, cyaneous, tipped with dusky-brown on the crown, with greyish-acrom, which passes a blackish bar—on the interscapularies, and with whitish—having a similar black bar—on the scapularies and small wing-coverts; throat, fore-part of the neck, and breast, also broadly tipped with fulvous-white, having a black subterminal cross-streak; belly, under tail-coverts, axillaries, and fore-part of the under-surface of the wings, deep ferruginous, the abdominal feathers broadly edged with whitish, having a narrow black subterminal band, and above this more or less cyaneous, especially on the flanks; wings and tail dusky-black, more or less edged with cyaneous and whitish: in this state of plumage it is the *Turdus Manillensis*, Gmelin. A specimen from Tenasserim, minutely agreeing in all other respects, has the feathers of the upper-parts less bordered, the axillaries and under-surface of the wing have merely a few slight traces of the rufous colouring, which is replaced by cyaneous, the large under tail-coverts are partly of this latter hue, which is also considerably developed on the abdominal feathers, and almost wholly supercedes the rufous on the flanks. Another specimen from Tenasserim has but a very slight trace of rufous left towards the vent and bordering the under tail-coverts, being elsewhere wholly cyaneous, excepting the dusky black of the large wing and tail feathers, and the tips of some of the wing-coverts, which are whitish. Finally, the Chyebassa specimen is totally devoid of any rufous trace whatever, but has most of its clothing feathers slightly dusky-tipped, with minute pallid extreme tips, in which condition of plumage it accords with *P. Pandoo*, Sykes. A female, being the *P. Maal*, Sykes, before me, (locality unknown,) corresponds in plumage to the same sex of the Himalayan *P. erythrogastra*, but has

\* The Society has since received *S. Nipalensis* from Mr. Hodgson, and it is distinct.

the upper-parts of a dingy bluish grey-brown, the large wing and tail-feathers principally dusky, coverts more or less whitish-edged, and under-parts mottled with whitish, having a dusky black subterminal cross-band to each feather. In *P. erythrogastra*, the deep rufous tint of the under-parts of the male is permanent and constant, but in a very few, I have seen an additional slight rufous patch surrounded by the cyaneous of the fore-neck.

\**Motacilla variegata*, Latham, *Gen. Hist.* VI. 320; *M. picata*, Franklin, *P. Z. S.* 1831, 119: a male in summer and another in winter plumage.

*Anthus arboreus*.

*Cinnyris Mahrattensis*: adult and young.

*C. Sola*: male.

*Zosterops Maderaspatanus*: two males.

\**Pyrgita flavicollis*: female.

\**Amadina punctata*: young male.

\**Estrela formosa*; *Fringilla formosa*, Latham, *Ind. Orn.* I. 441, 23, as quoted in Shaw's 'Zoology,' IX. 466: male.

*Erythrospiza*—? (*rosea*, apud Hodgson). A species very different from the *E. rodopepla* and *E. rodochroa*, figured by Gould, and which is commonly sold alive by the dealers in Calcutta. I have now several living specimens of it. Lieut. Tickell names it *Pyrrhula roseata*, but I doubt much if a prior name might not be found, although I have myself been unsuccessful in satisfactorily determining the species. Length five inches and three-quarters, of wing three inches and a quarter, and tail slightly forked, its outermost feathers two inches and a quarter; bill to forehead above three-eighths of an inch, and considerably bulged; tarse five-eighths: general colour, in winter aspect of plumage, deep ruddy on the upper parts, passing into dusky-roseate on the forehead, rump, and upper tail-coverts; the nuchal feathers tinged with ashy, and the dorsal margined with dusky-olive; throat and breast roseate, paling below the belly, and lower tail-coverts rosy-white; wings and tail dusky, the feathers edged with ruddy-brown, a little albescent on the outer edge of the tips of the tertiaries; bill and feet horny. In summer aspect of plumage the feathers have lost their marginal edgings, the back appears greyish-brown, and the crown, throat, fore-neck, and rump, are brilliant crimson. The female is altogether olive-brown, paling below, and whitish on the belly; the wing-coverts and tertiaries are tipped with pale yellowish-brown, and the clothing feathers of the upper parts, excepting on the rump, with those of the fore-neck, breast, and flanks, are centred darker. Song a feeble twittering, but soft and pleasing, intermediate to that of the European Goldfinch and that of the small Redpole Linnet; the call-note much resembles that of a Canary-bird, which group indeed this species nearly approximates in its conformation.

*Columba Javanica*: an injured male.

*C. (Alsocomus) puniceus*, Tickell: six specimens. A splendid species of Dove, allied to the last, and also nearly related, it would seem, to the Javanese *C. lacernulata* of Temminck; but differing from that species, as described, by having dusky-black upper tail-coverts, in the bill not being "wholly black," but vinaceous-purple at base with a greenish-yellow tip, and presenting some other minor discrepancies. Length fifteen inches and upwards, of wing eight inches and three-quarters, and tail six

inches and a half; bill to frontal plumage three-quarters of an inch, and tarse seven-eighths of an inch. "Irides orange with a red outer circle; feet dull lake." General colour rich and deep vinaceous-brown, having the whole top of the head, including the occiput, whitish-grey; primaries and secondaries, with the coverts of the primaries, winglet, and tail and its coverts, black, most of the large wing-feathers inclining to grey towards their margins; rump also black, the feathers margined with glossy dark amethystine-purple; interscapularies broadly edged with the same, changeable to green, which latter predominates, while a reddish gloss prevails on the edges of the scapularies and wing-coverts; throat paler in some specimens, and the under-parts generally less glossy than those above.

*Gallus Bankivus*: male and female. The latter remarkable for bearing powerful spurs, which is very unusual in this sex.

*Francolinus vulgaris*: two males and two females. The *Perdix Hepburnii* of Gray, with its alleged variety, appear to me to be meant for females, or perhaps young males, of this common species.

— *Pondicerianus*: male and female.

\*— *Northia*; *Polyptectron Northia*, Gray and Hardwicke: female. Length eleven inches and a half, of wing five inches and a half, and tail three inches and five-eighths; bill to forehead three-quarters of an inch, and to gape seven-eighths of an inch; tarse one inch and a half. "Irides dull orange, bill horn-coloured, legs and feet vermillion." Space between the bill and eye almost nude, and deep coral-red in the dry specimen. All the upper parts rufous-brown, with two or three black bands on each feather, beyond the last of which the tip of the feather is less rufous; there is also a number of minute black specks on each plume, in addition to the bands; rump and upper tail-coverts minutely freckled; the tail-feathers chiefly blackish, with mottled rufous bars tending to become obsolete; primaries, their coverts, and the winglet, spotless dusky; crown blackish and subcrested; the neck olive-brown, albescent on the throat; on the lower part of the fore-neck the feathers become rufous in the centre and tipped with black, being laterally margined with olive-brown; and on the breast and flanks they are bright ferruginous with narrow black tips, somewhat like those of an English cock Pheasant; belly fuscous-brown, and under tail-coverts resembling the upper; wings and tail dusky underneath. The *Perdix oculatea* of Hardwicke and Gray would seem to be nearly allied to this species.

*Coturnix dactylisonans*: three specimens.

*C. textilis*, Tem.: a female.

\* *Hemipodius Dussumieri*.

*Cursorius Asiaticus*.

*Pluvianus Goensis*: two specimens.

*P. bilobus*.

*Limosa melanura*.

*Totanus ochropus*.

*Anastomus typus*, Tem.: young.

*Ardea Javanica*: adult and young.

\* *Porzana Akool*: *Rallus Akool*, Sykes, *P. Z. S.*, 1832, 164.

\* *Mergus serrator*: female.

*Sterna seena*, Sykes.



\**Carbo albiventer*, Tickell: female. Length about twenty-nine inches, of wing eleven inches, and tail (consisting of fourteen feathers,) seven inches; bill to forehead (in a straight line) two inches and a half, and to gape three inches and seven-eighths; tarse two inches and a half; longest toe and claw three inches and three-quarters. Colour of the whole under-parts white, but apparently changing to dusky on the fore-neck and breast; flanks dusky brown; upper-parts dingy dark-brown, but a number of new feathers appearing on the scapularies and shoulders of the wings, dark silvery grey with a moderately broad black margin, analogous to what is observed in various other species; feathers of the crown and sides of the neck slightly margined laterally with whitish; bill dusky above, the rest pale; gular skin yellow, and feet and membranes black.

From M. M. Liautaud (Chirurgien de Marine) and Reymoneng (Elève) of His French Majesty's Corvette, the *Danaide*, I have to announce the presentation of a collection of bird skins and of shells from various regions; the former consisting of, firstly, the following European species, killed in France:—

\**Alcedo ispida*.

\**Turdus torquatus*: female.

*Oriolus Galbula*, ditto.

*Sturnus vulgaris*.

\**Charadrius pluvialis*.

From Panama (Republic of New Granada),

\**Tanagra episcopus*.

From Chili (neighbourhood of Valparaiso),

\**Turdus Magellanicus*, Vigors, *P. Z. S.* 1830, 14; being a new locality, I believe, for this species, which is allied to the well known Robin Thrush of North America.

From Bone Bay, in the Caroline Islands,

\**Ptilinopus purpuratus*, Swainson: the example of which most elegant species, heretofore known as an inhabitant of O Tahiti, has unfortunately been denuded by insects of the skin of the fore-part of the forehead and throat.

From Luçonia, of the Philippines,

*Petrocincla Manillensis*: being the specimen before noticed in my account of the collection of bird-skins presented by Lieutenant Tickell.

\**Ceblepyris cœrulescens*, Nobis. Length nine inches and a half, of wing four inches five-eighths, and tail three inches and a half; bill to forehead (through the feathers) fifteen-sixteenths of an inch, and to gape an inch one-eighth; tarse three-quarters of an inch: fourth, fifth, and third primaries successively longest; outermost tail-feathers not half an inch shorter than the middle ones. Colour of the upper parts black, the feathers edged with bluish dusky, paler on the forehead, and inclining to greyish on the rump; tail and greater wing-feathers wholly black: lower parts uniform dark greyish-dusky; the tips of the outermost tail-feathers paler underneath: bill and feet black, as are also the lores.

From Captain C. S. Bonnevie, of the Norwegian Royal Navy,—

Specimens of *Lophastur*\*, Nobis, n. g? Allied to *Pernis*, but wanting the peculiar

\* This possibly be the genus *Buteopernis* adverted to by Mr. Jameson, in *Calc. Journ. Nat. Hist.*, No. III. page. 320.

character of that genus, the loral feathers resembling those of most other *Falconidae*: beak also distinctly, though feebly, toothed; and the cere much less developed than in *Pernis*: talons very feeble, and the anterior tarsal scales but semi-reticulate. Rest as in *Pernis*, and the medial occipital feathers elongated, as in *P. cristatus*, Cuv., v. *Falco ptilorhynchus*, Tem.,—as also in the genera *Hyptiopus*, Hodgson, v. *Lophotes*, Lesson (pre-occupied in Ichthyology), v. *Lepidogenys*, Gray, and *Spizatus*, Vieillot, v. *Nisætus*, Hodgson.

\**P. Jerdoni*, Nobis: adult and young. Length about eighteen inches or nearly so, of wing twelve inches and a half, and tail nine inches; bill, over forehead, including cere, an inch and a half, and from point of upper mandible to gape an inch five-eighths; greatest vertical depth about five-eighths of an inch, and arcuation (as in *Pernis*) very moderate; tarse anteriorly one inch and three-quarters, having the upper half feathered; middle toe and claw two inches, the latter barely exceeding three-eighths of an inch, and hind claw little more than half an inch. Lengthened occipital feathers of a spatulate form, and two inches and a quarter long in both specimens. Plumage of the adult, on the upper-parts, of a hair-brown colour, each feather broadly terminated with dusky-brown, having a fine reddish-purple gloss, which terminal portion is alone externally visible on the back and scapularies; primaries, secondaries, and tertiaries, crossed with a few bars of the same, and the latter edged at the tip with whitish; tail light hair-brown, with a broad subterminal dusky band, and three successively smaller ones, likewise successively less distant to the base; its extreme tip whitish: beneath, the wings and tail are whitish-grey, with only the terminal bands as much developed as above. Lengthened occipital plumes dull black; and the nape and sides of the neck rufous-brown, with a medial dusky streak to each feather, more or less developed. Lower-parts whitish, somewhat broadly banded across below the breast with rufous-brown; the sides of the breast rufous; and a mesial line on the throat, fore-neck, and breast, composed of feathers which on the throat are almost wholly blackish, becoming less deep and mingled with rufous on the fore-neck and breast, where laterally margined with white. Beak horn-coloured, with a pale cere; and legs have probably been yellow. The young merely differs in having each feather of the upper-parts slightly margined with whitish, and those of the lower-parts are analogous to the immature plumage of the genus *Accipiter*; the mesial dark streak flanked with whitish may be traced almost to the vent, and this is merely the same, further developed, as exists upon the throat of a common Indian species of *Accipiter*, viz. *A. Dussumieri*, v. *Dukhunensis* of Sykes. I dedicate this handsome species to a naturalist to whose persevering researches students of Ornithology in this country are deeply indebted, and whose investigations, I am happy to say, now extend throughout the series of the animal kingdom, and may be expected to add considerably to our information on the Zoology of India.

*Picus leucogaster*, apud Horsfield, Catalogue of Javanese Birds prefixed to 'Zoological Researches in Java': *P. Javensis*, Horsfield, *Lin. Trans.* XIII. 175; but not *P. leucogaster*, Reinwardt, apud Bory, *Dict. Class. d'Hist. Nat.* XIII. 507, if the size be there correctly stated; the breast, too, is described as "noire, rayée de roussâtre," but this may be the case in some specimens, as a few of the pectoral feathers of a female in the Society's Museum have slight rufous-white edgings, and the colouring of the female bird is otherwise correctly enough described by M. Bory.

Dr. Horsfield strangely describes the *P. pulverentulus*, Tem., as the female of this species, but we now possess both sexes, and the female only differs from the male in having no crimson moustache, nor on the crown but only on the occiput. This fine species is closely allied to the *P. Hodgsonii*, Jerdon, *Madras Journ.* vol. XI. 215, and there admirably figured, but is not quite so large, having the wing but eight inches and a half, and tail but six inches and a half, and it differs in having scarcely any trace of white above the tail, but only a narrow incomplete cross-band just above the coverts; there is also a very slight lateral margining of this colour to the feathers of the throat, and to the posterior ear-coverts; and the wings inside anteriorly, with the axillaries, are also white; the white of the belly being somewhat deeply tinged with fulvous. The present and our previous specimen are both from Bengal. A much injured skin from Tenasserim has considerably more white about the croup, thus further resembling the magnificent *P. Hodgsonii*: and I make no doubt that the so called *Picus maximus Malayensis*, described by Dr. W. Bland in *J. A. S.* II. 952, refers to no other; the colouring exactly corresponds, if *fulvescent* be read for "yellow" on the belly and under wing-coverts; but the dimensions there assigned considerably exceed those of our specimens.

*Gracula religiosa.*

\* *Vanga cristata*, Vieillot, badly figured in Griffith's *Animal Kingdom*, VI. 486.

*Euplocomus erythrophthalmos*: female.

Captain Bonnevie being desirous of putting this Society in communication with the *Collegium Academicum* of Christiana, for the purpose of exchanging duplicates of Indian specimens for such as could be procured for us in the North-west of Europe, I have gladly assented to his request by sparing for that body certain duplicate Zoological specimens, for the most part procured in this immediate neighbourhood, and not required for the Museum of the Hon. Company in London; and I have also furnished him, at his kind request, for transmission to the Norwegian institution, with a list of such desiderata procurable in Northern Europe, as would enrich and add much to the interest of our own Museum.

From J. J. Athanass, Esq.,

*Phaenicopterus ruber*: a beautiful adult specimen of this Flamingo, forwarded alive from the Upper Provinces, and which reached us before life was quite extinct, and consequently in a favorable condition for being properly mounted, its plumage being uninjured, with the exception of the wings.

Also skins of

*Gypaetos barbatus*, Storr; considered by Captain Hutton to be a distinct species—*G. Himalachanus*, *J. A. S.* III. 22, but which I agree with Mr. Hodgson (*Ibid.* IV. 458,) in inclining to regard as that found in Europe and North Africa, the more especially as among the drawings of the late Sir Alexander Burnes, I find one of a specimen devoid of the dark pectoral cross-band, which Captain Hutton presumes to be characteristic of the Lammergeyer of the Himalaya: a splendid adult.

*Circætus undulatus.*

From Dr. Pearson,

"*Accentor Himalayanus*" ? \* ; vide *J. A. S.*, ante, 187.

\* Distinct from two species of *Accentor* recently forwarded to the Society from Nepal by Mr. Hodgson.

From David Ross, Esq.,

An egg of the Cassowary (*Casuarius galeatus*).

From J. P. Hampton, Esq.,

*Plotus Vaillanti v. melanogaster*: the Oriental Anhinga. A magnificent adult male, in finest possible condition of plumage. The anatomy of this bird I only very cursorily examined, from pressure of other occupation, and rather regret that I did not put the body aside in spirits; though I doubt not I shall soon obtain others, as I understand the Anhinga is not rare within a few miles of Calcutta. However, the general conformation of the soft parts was essentially that of the Cormorants, as might be anticipated; the capacious stomach possessed the accessory sac (analogous to that of the Crocodile) found in other *Totipalmati*, Cuv.; the intestines were long and furnished with the two small cæca usual in this group; and the sternal apparatus, which has been preserved, is absolutely similar to that of a Cormorant.

From J. L. H. Gray, Esq. I have the pleasure to record the donation of skins of a very fine pair of

*Argus giganteus*, Tem.: male and female; and one of

\* *Phæton* ——— ? or Tropic bird; species undetermined.

From Mr. J. Keirnander,

\* *Aptenodytes Patagonicus*: Patagonian Penguin; the brightly coloured portion of the fore-neck and breast.

From — Borradaile, Esq.,

*Strix flammea*: the common Barn Owl of Europe, which is of very frequent occurrence in Bengal: a living specimen, since dead and added to the Museum.

From E. B. Ryan, Esq., two living Hawks; viz.

*Elanus melanopterus*; and

*Circus rufus*: both mounted in the Museum.

From Lieut. Phayre, through Dr. McClelland,

*Ardea purpurea*: the common Purple Heron; a specimen from Arracan.

Among the Birds procured in the neighbourhood, or from the dealers, I may briefly notice—

*Palæornis Alexandrinus*, v. *nipalensis*, Hodgson, *As. Res.* XIX, 177: young male, purchased.

*P. Malaccensis*: ditto.

\* *Lorius ornatus*, Stephens: ditto.

\* *Fulco tinnunculoides*, Tem.: adult female.

*Circus rufus* v. *æruuginosus*.

*C. Swainsonii*, v. *pallidus*.

*C. melanoleucos*.

*Cuculus fugax*, Horsfield, v. *C. Lathamii*, Gray: a good series.

*C. canorus*: the true British Cuckoo, which I have now living in a cage.

*Phœnicura atrata*.

\* *Budytes citreola*?

\* *Coturnix textilis*.

*Grus cinerea*.

*Parra Indica*: adult and young, which latter totally wants the conspicuous white eye-streak of the adult, and is otherwise so different, that until I obtained a specimen in a state of change, I rather inclined to doubt their specific identity.

*Dendrocygna major*, Jerdon.

*Tadorna Bellonii* v. *vulpanser*, Auct: the European Shieldrake, of which this is the second specimen I have met with in the bazaar; and lastly, I shall only further mention

*Glareola torquata*; the Collared Pratincole: a specimen of which I had the good fortune to procure alive, leading me at a glance to perceive its true affinities, which heretofore had constantly puzzled me, in common, I believe, with every student of Zoology who has bestowed attention on the classification of Birds. Linnæus arranged this bird as *Hirundo pratincola*; and Baron Cuvier included its genus among his *Echassiers* or "Stilt birds;" viz. the *Grallatores*, or "Waders" of modern English systematists, remarking—"Nous terminerons ce tableau des échassiers par trois genres qu'il est difficile d'associer à d'autres, et que l'on peut considerer comme formant séparément de petites familles." The three genera adverted to are *Chionis*, *Glareola*, and *Phænicopterus*; which are associated also by M. Temminck in his heterogeneous assemblage of odds and ends, styled by him *Alectorides*. Now, of these three genera, the first, or that of the Sheathbill (*Chionis*), has been satisfactorily referred by M. Blainville, on anatomical data, to the immediate proximity of *Hæmatopus*, an association of which the propriety is readily seen when once suggested\*, and on similar data I have long been satisfied that the Flamingoes (*Phænicopterus*) should be ranged among the *Lamellirostres* or *Anatidæ*, a position which has also been assigned to them by Mr. Swainson: this latter author, in common with most of the recent British writers on Ornithology, has referred the Pratincoles to the *Charadriadæ*, or Plover family, associating them more immediately with *Cursorius*; but Mr. Jenyns (in his *British Vertebrata*), really as if selecting the most *outré* position he could find, has included this genus in his *Rallidæ*†! There, too, Mr. Yarrell (in his 'British Birds') has followed him in grouping it; but this naturalist was so fortunate as to obtain an egg of our present species, which he has figured, and remarks that "the Pratincole has been arranged by some authors with the Swallows, by others near the Rails: but I believe, with Mr. Selby, that it ought to be included in the family of the Plovers; and had I known its Plover-like habits and eggs sooner, I should have arranged it between *Cursorius* and *Charadrius*." The figure of the egg which he has given, however, appears to me to accord still better with my view of the affinities of this genus. Several years ago, Mr. Gould called my attention to the fact that the Collared Pratincole had a slightly pectinated middle claw, and suggested to me whether, after all, the great Swedish naturalist was not right, at least in bringing this bird among the *Insesores Fissirostres* of Vigors; but at that time I inclined to hold a different opinion, and so far as the structure in question is concerned, that alone could scarcely influence the systematic position of the genus, as it occurs in widely separated families‡; and as I have further always held the opinion

\* Allied to *Chionis* are the remarkable genera *Attagis*, d'Orbigny, and *Tinocorus*, Vieillot, from the South American Cordilleras, and the anatomy of these equally refers them to the same systematic station. Vide Zoology of the Voyage of the Beagle under Captain Fitzroy.

† I need not ask what character it has in common with the Rails, but rather what it has not in direct and obvious opposition to them?

‡ E. g., in many *Caprimulgidæ*, *Ardeadæ*, and *Pelicanidæ*; its intent being apparently to cleanse the *rectus* from such fish-scales, &c. as may adhere thereto, or, in the instance of the *Caprimulgidæ*, to detach the legs of beetles which may ditch, and thus impede the bird's swallowing them.

that the *Pressirostres* and *Longirostres* of Cuvier (corresponding to the *Charadriadæ* and *Scolopacidæ* of modern English systematists) composed but a single great series, essentially distinct from the *Cultrirostres*, Cuv. (*vel Gruidæ et Ardeadæ*), which the illustrious French zoologist interposed between the former, an analogous conformation was not wanting in that series, as instanced by the Black-tailed Godwit (*Limosa melanura*), while no trace of it occurs in the Bar-tailed Godwit (*L. fedoa*). Examining, however, the entire foot of a recent Pratincole, it will be seen that the resemblance it bears to that of *Caprimulgus* extends to the peculiar scutation, to the general form of the toes, and especially to the circumstance of the back-toe being directed inward; and whoever has witnessed the creeping gait of a British Moth-hunter (*Caprimulgus*) on the ground, will not fail to recognise in that of the Pratincole an exact similarity: moreover, many species of *Caprimulgus* have the tarse as much elongated as in *Glareola*, and I have been informed that certain of these assemble numerously on the mud flats near the shores of some of the West India islands, where their habits would appear to resemble those stated of the Pratincoles. The mode of flight, too, of the latter is absolutely that of the Moth-hunters, and not by continuous flappings, as in all the *Charadriadæ*. But what first led-me to perceive the affinity which this genus bears to *Caprimulgus*, was the expression of the physiognomy of the living bird, as I held it in my hand, and, to descend to particulars, the semi-tubulate form of its *nares*, and downward curvature of the short bill seen alike in both, though the latter is so much larger and stouter in *Glareola*; then, looking to the feet, the similitude was at least equally striking, while the form of the wings and tail, and mode of flight, were such as might be expected to occur in a diurnal modification of the family *Caprimulgidæ*, and together with the wide gape helped to remove this genus from the grallatorial order altogether. Even the egg, as figured by Mr. Yarrell, has not the pointed form at one end, characteristic of those of the Snipe and Plover series; but would appear to resemble nearly that of a *Caprimulgus*, in shape as well as in markings. On the other hand, the discrepancies of *Glareola* with any of the varied forms of nocturnal *Caprimulgidæ*\* are sufficiently obvious externally, while internally there are some very strongly marked differences; such as the configuration of the sternum, which is doubly emarginated posteriorly, and otherwise more approximates the form of this important portion of the skeleton of the *Charadriadæ*, while the tongue also is broad and flat, with a thin serrated tip, and the muscular coat of the stomach is considerably developed,—particulars at variance with the type of *Caprimulgidæ*, but which I only now briefly advert to, since I have not lately procured an example of the latter family with which to institute an anatomical comparison. Upon the whole, I have arrived at the opinion that the Pratincoles are more nearly related by affinity to *Caprimulgidæ* than to any other family in the class, but I hesitate as to whether they should be actually included therein, though, if so, I think that they should be regarded as at least constituting a very distinct sub-family, apart from the nocturnal genera, and thus I incline provisionally to arrange them.

#### REPTILIA.

All that I have to notice, in this class, among the donations of the past month, consist of two specimens of *Testudo geometrica*, very young, which were packed with the

\* *Caprimulgus*, *Ægotheles*, *Podargus*, *Scolopastrix*, *Nyctibius*.

other specimens received from Lieutenant Tickell; and a small banded *Gymnodactylus*, from Afghanistan, nearly allied to a species formerly transmitted to the Society by Lieutenant Tickell from Midnapore, and for which we are indebted to Dr. Thomson. This I shall characterize when I come to notice certain others of the Gecko tribe, which I am now trying to collect.

#### PISCES.

For the only specimen of a Fish, the Society is under obligation to Dr. Spry, who has presented us with a small recent example of *Zygæna laticeps*, Cantor, ('Quarterly Journal of the Calcutta Medical and Physical Society,' for July, 1837, p. 316, and beautifully figured at p. 318): it was taken in the Hooghly.

#### MOLLUSCA.

The interesting series of Chusan Shells presented by Dr. Cantor to the Society, have already been enumerated in his letter, and accordingly need only here to be thus briefly mentioned.

Those presented by M. M. Liautaud and Reymoneng, consist of the following species, of which such as are marked with an asterisk, bear the names with which those gentlemen have favored me: in determining some of the others, I have received the kind assistance of Dr. Cantor:—

From Toulon,

\* *Natica castanea*.

\* *Helix variabilis*.

\* *Pupa cinerea* (Mink?)

\* — *maculata*.

\* *Cyclostoma maculatum*.

From Algiers,

\* *Bulimus decollatus*, Draparnaud.

From Teneriffe,

*Caracolla pyramidalis*.

From Acapulco, Mexico,

*Fissurella* — ?

From Panama,

*Bulimus* — ?

From Guayaquil, Equatorial America,

\* *Bulimus depuna*, Sowerby (?)

From Monte Video,

*Planorbis* — ?

From Lima,

\* *Physa Peruviana*, Sowerby.

From the Sandwich Islands,

*Bulla fasciata*, Lamarque.

From Bone Bay, Ascension Island (of the Carolines),

*Bulimus* — ?

From the Phillipines,

*Bulimus gracilis*, Lea, *Trans. Am. Phil. Soc.* (n. s.), VII. 458, and pl. XL, fig. 6; being the third or white variety described by that naturalist; Luçonia.

*Helix gigantea* : Luçonina.

*H. polychroa*, Sowerby, *P. Z. S.*, 1841, 87, subgenus *Cochlogena*, de F.; *Bulimus virido-striatus*, Lea, *loc. cit.*, ante, p. 456, and pl. XI. fig 2.

*H. luteo-fasciata*, Lea, *Ibid.* p. 462, and pl. XII. fig. 13, but of a less flattened form than is there represented : Puerto Galera.

*Cyclostoma Woodianum*, Lea, *Ibid.* p. 465, and pl. XII. fig. 1.

*Mytilus* — ? (Brackish water.)

From J. G. Heatley, Esq., I have the pleasure to acknowledge the presentation of a large and interesting collection of Shells, chiefly marine, procured from both the Asiatic and Australian shores of the Indian Ocean. The number of species comprised in this collection is far too great for me to attempt a catalogue of them on the present occasion.

#### INSECTA.

A valuable box of Insects, collected in Afghanistan, and especially interesting from the attention which has been alike bestowed on all the orders, has been presented to the Society by Dr. Thomson. The general character of these, I may briefly remark, and as may be supposed, is European, with an admixture of tropical forms, analogous to those found on the Himalaya. A variety of British species occur, and among the very few *Lepidoptera* sent, are included the extensively distributed *Cynthia cardui*, little *Polyommatus Alexis verus*, which the Society also possess from Kumaon, *Hipparchia Megæra*, of which also we have a Kumaon example, other species of this group—one common in the vicinity of Calcutta, and a handsome white-bordered species allied to *H. Semele*,—a *Thecla*, which appears to be the European *Batica* figured by Boisduval, *Thestia Pirene*, *Sphinx convolvulus*, the domestic *Bombyx mori*, and five or six other species undetermined. The number of *Hymenoptera*, *Coleoptera*, *Orthoptera*, and even *Diptera*, as well as *Hemiptera*, is considerable; but I cannot at present do more than notice them thus generally and briefly.

Again congratulating the Society upon the extraordinary number of donations with which it has been lately favored, indicative of the rapidly increasing interest taken in its Museum, and which, it may readily be conceived, has found me pretty ample employment in determining so many species as have been enumerated, not to mention various others, it now only remains to subscribe myself,

Sir,

Your most obedient Servant,

EDWARD BLYTH.

*Accompanying plate* Figs. 1, 2, 3, Skull of undescribed *Bos*, from the Keddah Coast, in the London United Service Museum (vide p. 447); 4, occipital view of Gaour's Skull; 5, Horns of the Banteng, or Wild Ox of Java (p. 446); 6, Head of *Cervus niger*, Blainville, from one of the late Dr. Buchanan Hamilton's drawings.—E. B.

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#### *Museum of Economic Geology.*

Read the following report of the Superintendent of the Museum of Economic Geology on a specimen of Limestone, from Darjeeling, referred to the Museum by Lieut. Broomer, and his report on the Museum for April, 1842.







H. TORRENS, Esq.

*Secretary, Asiatic Society.*

SIR,—I have to report upon the specimen of limestone from Darjeeling referred to the Museum by Lieutenant Broome, that it is a very pure stalagmitic limestone, containing ninety-eight per cent. of pure carbonate of lime, the remainder consisting of traces of iron, minute portions of siliceous matter, and some animal and vegetable matter, to which its colour is owing.

2. On a large scale, the produce may be somewhat less if it is found that fragments of other rocks are imbedded in it; ours having one or two small fragments of common serpentine; but this will make but little difference in its value as a useful limestone.

3. As this is so very pure, and differs so much from the kunkurs in appearance, and by the absence of siliceous matter and iron, I have called it a stalagmitic limestone. If found in a cave, it is possible the original rock may not be far off, and that organic remains will be found beneath the floor of the cavern: both should be carefully searched for.

I am, Sir,

Your obedt. servt.

Calcutta, 4th May, 1842.

H. PIDDINGTON,

*Superintendent, Museum Economic Geology.*

### *Report of the Superintendent of the Museum of Economic Geology for the month of April.*

*Museum Economic Geology.*—We have nothing to report here for the present month, it being useless to undertake any arrangement when we should have to break it up again in the approaching removal of our cases to the rooms downstairs which are to be appropriated to them, and these must first undergo considerable repairs.

I have drawn up a Circular, explaining in a popular style the beneficial objects of the institution, with its wants, which our Secretary has sent to the Press, and I hope it will be ready to be submitted at our next meeting.

*Geological and Mineralogical Departments.*—We continue our arrangements here, and I am glad to report amongst them, that after a persevering search, the recovery of sixty-eight specimens out of seventy-seven, comprising the splendid and unique chronological series of Lavas from Vesuvius, from the Cabinet of the King of Naples, which was presented to the Society by our late President the Honorable Sir Edward Ryan. The catalogue of this series, with a translation, is in the hands of the Printers. In anticipation also of our now receiving Captain Herbert's catalogues from Mr. Batten, I have commenced arranging his series according to their numbers. I am also proceeding with the large Geological series mentioned in my last.

*Museum Economic Geology.*—The donations have been two bottles Sulphur water from the White Sulphur springs of Greenbriar County, Virginia, by the Agricultural Society.

A specimen of the best German Lithographic Stone, from Messrs. Ballin and Co.

*Geological and Mineralogical.*—A specimen of silicified wood from Van Diemen's Land; and

A stalagmitic ball from Chirra Poonjee, from F. Heatley, Esq.

H. PIDDINGTON,

30th April, 1842.

*Superintendent, Museum Economic Geology.*

For these Presentations and Contributions the thanks of the Society were accorded.



# JOURNAL

OF THE

## ASIATIC SOCIETY.

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*A few Instructions for Insect Collectors.\** By V. TREGGAR, Esq.

Entomological collections are now-a-days rather numerous in India, and would be more so, if the mode of preserving insects were generally known. There are many better qualified than myself to give instructions on the subject, but as the few directions I am able to give may be useful, I do not hesitate to offer them for the Journal. Independent of its scientific value, a well-preserved collection of insects is an object of attraction and interest to the most apathetic; the elegance and brilliancy of colouring, in some equalling the rainbow hues of the most beautiful birds; and the "shapeless" shape of others, in which they exceed, perhaps, the most fantastic formed monsters of the deep, with the wonderful variety of both colour and form, create those agreeable sensations of surprise and admiration, which constitute a large portion of the feeling called pleasure. Such a collection is not to be formed without trouble and attention, and if the necessary share of the former be bestowed on the first preparation and setting up, but little will be subsequently required. The great annoyances are damp and insects; the former is avoided by making the cases of dry wood, well varnished, or painting them in dry weather,

\* There is a paper "On the preservation of objects of Natural History," in the 4th vol. of the Journal of the Asiatic Society, by Dr. Pearson, an excellent authority on all such subjects.

and keeping them in a dry place; attacks of the latter are prevented by the application of arsenical soap, and having a quantity of camphor constantly in the cases; but this last is an expensive article as it readily evaporates, and some cheap and efficient substitute is a desideratum. The articles a collector must be supplied with are, pins, arsenical soap, a pair of fine pointed scissors, a lot of bristles from a large painting brush, a solution of lac in spirits of wine, a hand net, a collecting box, a drying box, and glazed preserving cases.

The pins are made expressly for the purpose in England, France, and Germany, and are, there, very cheap; their sizes are various, from one inch and a half to three inches long, and of corresponding thicknesses; they are absolutely necessary, for the common pins are too short even for middling sized insects, and too coarse for smaller ones; another great advantage in the proper pins is, their allowing the insects to be kept at a distance from the bottom of the box, by which they are removed somewhat from damp, and placed out of reach of any insects which may breed in the lining.

Arsenical soap is easily made according to the recipe given in Dr. Pearson's paper. [Vide p. 478.] I have made it with native soap, which if of good quality, loses its offensive smell when mixed with the other ingredients.

The bristles are very useful for strengthening such insects as from slenderness would be liable to break, and for joining broken legs or antennæ; for the latter purpose a bristle dipped in the lac solution is inserted lengthwise into one of the pieces, leaving enough to go similarly into the other piece, the rest is cut off, and then the two joined together. For large insects a slip of bamboo peel is better, as being stronger, and in some cases cotton must be wrapped round it to give the size and shape of the body. I would generally advise the use of one or the other.

The lac solution is made by pouring on the pounded lac a quantity of strong spirits of wine, and placing it in the sun (close corked) till dissolved; it should be thick, and is useful in joining broken insects, and fastening on limbs.

The net is of gauze, eighteen inches long, and sewn on a wire or rattan ring one foot diameter, the handle of any convenient length.

The collecting box which I use is thirteen inches by eleven, and three

inches deep, a pane of glass forming the front, and divided in two by a partition, which is again crossed by two others, making six divisions in all, each having a door one inch in diameter, closed by a disc of copper which swings on a small screw; each division opens behind also, to remove the contents, the door there being the whole size of the division. A box with many partitions is also very useful for sending to a distance, allowing each insect to be kept by itself, preventing their injuring each other, which they would do if many were jumbled together. It is a very bad plan to let the native collectors pin the insects as they catch them, for it is sure to be ill done, and moreover, as little pain as possible should be inflicted.\*

Any box will do to dry the insects in, provided it excludes light and ants, the former having a very injurious effect on colours, particularly of Lepidoptera, which lose much of their brilliancy even from common daylight, and the cases containing them should therefore be kept covered. The form of cabinet is a matter of taste, but I think none will be found better than the one contrived by Dr. Pearson, for the Museum of the Asiatic Society. When open, it shews four perpendicular rows of boxes; of these two rows are in the body of the cabinet, and one row in each of the doors, the latter being made deep enough to receive them; when shut, the boxes in the doors face the others, and thus light and dust are excluded, and the contents of the whole exhibited at once when required. The individual cases may be of any convenient size; my own are twenty-two inches by sixteen and three quarters, and half an inch deeper than the longest pin; the top half fits into the bottom by a rebate three-quarters of an inch broad,

\* A word or two on the "cruelty" of which Entomologists are accused. If by that word is meant "infliction of pain," I must plead guilty, but who are the accusers? Surely not you, my good Sir, who boast of the forty brace of snipe, or the fifty ditto quail have fallen before you. Nor you, my dear Madam, who, since this day last year, have delivered to the tender mercies of the cook, heaven only knows how many times 365 sheep, ducks, geese, fowls, &c. &c.—"Oh! but that was necessary"—Indeed! "we'll argue the point" some day, or if my accuser be of Wordsworth's "creed,"

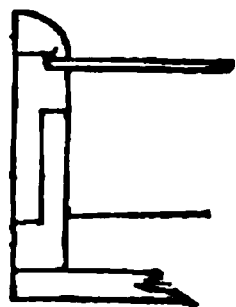
That every flower

Enjoys the air it breathes;

then are we equally guilty; for believe me, the fragrant rose which Chloe received with such a smile and blush—did, when you plucked it,

Feel a pang as great

As when a giant dies.



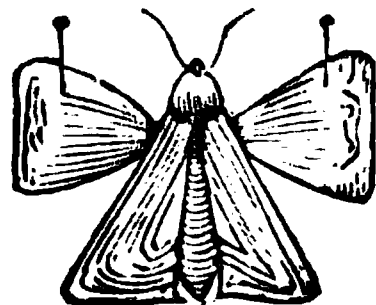
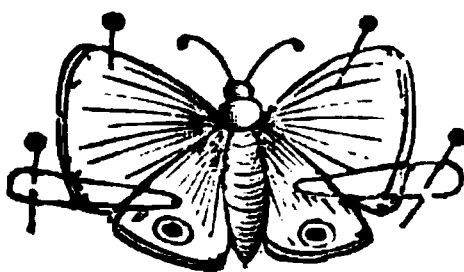
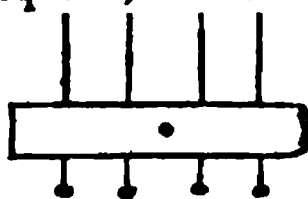
and the box opens at about half its depth; the sides are five-eighths of an inch thick, and the bottom a quarter of an inch, the former well varnished, and the latter painted, inside and outside; if made in dry weather no injury is to be feared from damp. A single pane of glass is best on all accounts, and when let into the top, a slip of paper should be pasted over the edges of the box and glass, and a beading nailed or screwed on it. The bottom may be covered with cork, (which is good, but dear,) sola, or wax; the sola is prepared in sheets in Calcutta, and the paste used should always have some sulphate of copper dissolved in it; wax is excellent for the purpose, but (here) very dear. I have two boxes lined with it, and have not yet found any "uninvited" insects in them, while many have appeared in those with sola; the commonest wax is the best, as its strong smell may be in its favor, and it is cheapest. To line the box place it as level as possible, melt the wax, and pour it through a coarse cloth; it will, (if at a proper heat,) spread all over the box, which must be moved as required, if not quite horizontal: one-fourth of an inch is thickness sufficient, and all but large and heavy insects may safely be trusted in it, even with the boxes hung against the wall.

When an insect is caught, the first operation is to kill it, which, with all but Lepidoptera, may be performed by putting them in spirits of wine, or into a tin box placed in boiling water; large ones may be thrown at once into the water, which kills them instantly without injury, but this mode is for those only of strong make and dull colours, at least I have not ventured to adopt it with any but such. Butterflies and moths die on pressure of the thorax below the wings, taking care not to squeeze so hard as to burst it.

When dead they are to be cleaned, which in very many species is best done by raising the wing cases and wings, and removing the soft skin underneath; the whole of the entrails must be taken out, and the shell wiped with cotton; diluted arsenical soap is now to be applied with a camel hair brush, and some should be thrust into the thorax and head also if possible; close the wings and elytra, and through the right one insert a pin of fit size, bringing it out between the legs; about half an inch of the pin must be left above the insect for the convenience of holding it, and the whole length should be such as to keep



the legs well clear of the bottom of the box, and allow a good hold in the lining. Those species in which the upper part of the body is exposed, must be opened below, either by a longitudinal cut, or removing a triangular piece; if the body be soft, the bristle or slip of bamboo put in it is to be wrapped with cotton to its size and shape, and the skin carefully placed over it; this is particularly necessary with the Orthoptera and Neuroptera, which, otherwise, lose very much of their natural appearance. The Coleoptera alone are pinned through the elytrum, all others through the middle of the thorax, and there are many of every order too minute to admit of being stuck either way. Dr. Pearson uses a strip of quill, one end being inserted between the rings of the abdomen, and through the other a pin is run; but as the quill is liable to curl and twist, I prefer using a bristle or fine pin, which is placed in a piece of cork, and by having the latter one inch long and quarter inch square, three or four small insects may be put side by side on one pin; a bottle cork will make several slips. The legs, wings, and antennæ, are to be placed in their natural position by pinning the insect to a loose piece of sola, brought conveniently near the body of the insect; the feet are fastened down by pins bent to a bayonet shape, or by slips of card pinned over them, which latter are also used to retain in a proper manner the wings of butterflies, &c. For Lepidoptera, the sola to which they are temporarily attached, should have a long hollow to receive the body, that the wings may lie quite flat; the upper pair in butterflies and some moths should be carried well forward to expose the whole of the lower ones, and may be held so by fine pins stuck through whose under wings are upper in repose, I the former be drawn opened so much only



as to shew the body, as in the following sketch; this method exhibits the natural form of the insect, as well as the under-wings, which are often very beautiful.

When the insect is pinned, and its limbs properly arranged, it is to be placed in the drying box till sufficiently rigid to allow of removal

to the preserving cases. I do not advise sun-drying, as it often causes a shrivelled appearance, particularly with soft-bodied or delicate insects.

In the cabinet, they are to be kept as far from the lining as possible, and the feet should on no account be allowed to touch it.

Insects are sometimes preserved in spirits, but I have always found them liable to become mouldy when subsequently set up in boxes, which however may have been from the weakness of the spirits used; when the plan is adopted, I would advise their being cleaned out as elsewhere mentioned. Large insects with strong mandibles should not be put alive with others, as they will probably destroy their legs or antennæ.

Practice will suggest many minutiae which I omit. The directions given will, I am certain, be found useful to those who wish to commence a collection, but do not know how; it is rather tedious work at first, but facility is soon acquired, and as the number of specimens increases, the labour is forgotten. A few boxes full have such a satisfactory appearance, that the pursuit will certainly be carried on with redoubled activity, and perhaps a taste for Natural History in general created, employing pleasantly time, which may otherwise pass but heavily.

Books on Entomology are expensive. I would recommend "Westwood's Text Book," as a cheap and useful work for a novice, and Boitard's "Manuel D'Entomologie," which is an excellent aid, as it gives a description of some thousand species, and contains an analytical table, by means of which the species to which any insect belongs, can be soon found.

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*Recipe for preparation of arsenical Soap.*—*As. S. Journ.* Vol. iv. p. 462.

Take of Arsenic in powder, 2 lbs. White soap, 2 lbs. Salts of Tartar, 12 oz. Lime in powder, 4 oz. Camphor, 5 oz.

Cut the soap into thin slices, and melt it in a little water or spirit of wine over the fire; then add the salts of tartar and the lime. Take the mixture off the fire, and add the arsenic, taking care to mix it well by trituration in a mortar, or other convenient vessel; and when nearly cold, mix in the camphor, previously reduced to powder by the help of spirit of wine. When thus made, keep the arsenical soap in a glazed earthen pot, or a wide-mouthed bottle, and when used, dilute it with water to the consistence of cream.

The principal materials for both the above preparations may be procured in every bazar in India.

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*A Vocabulary of the Kunawur Languages. By Captain  
GERARD, B. N. I.*

The following vocabulary was found amongst some old papers in the Society's records, and it was deemed an act of justice to the memory of its highly talented and industrious author to publish it, as well as one of public and scientific utility.

For the ethnographical importance of the study of these various dialects, or languages, is now so well appreciated, and the materials collected are turned to so good an account, that it becomes a prominent duty to allow no collection of this kind, whether well or ill executed, to remain buried; and for us especially so, where it may relate to that highly curious subject of research, the aboriginal languages of the various parts of India, and their relations to the great parent stocks, towards which the patient labours of men like the lamented W. Humboldt,\* are gradually tracing them. We quote with satisfaction in this department of Oriental research to the labours of Lieut. Leach, in the Pooshtoo Language; Lieut. Tickell on the Hos; Mr. Edgeworth on the Cashmiri; Dr. Campbell on the Moosmi and Limboos, and on the Mechi dialects; and to this on the Kemaon languages, all of which have enriched our Journal within the last three years, and to the many which are preserved in its earlier volumes. We have now in hand in

\* We refer here particularly to his splendid and laborious work "Ueber die Kawi Sprache auf der Insel Java."

addition to these, a brief vocabulary of the Goand language, from the MSS. of the late Dr. Voysey, and we trust that the friends of science, and we will add, of humanity, (for the knowledge of the language of the savage or the half-civilised man is the first step to the humanizing influences of civilisation,) will not fail to remember that even a few hours spent in noting down, from time to time, words of *any* dialect of *any* tribe, may throw an invaluable light on this complex but curious problem, and perhaps furnish one day to the political agent, the military officer, the traveller, the trader, and the philanthropist, the most effective means of forwarding, each in their sphere, the power, the knowledge, the wealth, or the moral influence of our noble father-land.

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ENGLISH.	MILCHAN.]	B,НОТЕРА OR TARTAR.	T,HEBBERSKUD.
Father, ..	Baba, ..	Apa, ou, agoo, ..	Apa, kea. ..
Mother, ..	Umma, ..	Umma, ..	Umma. ..
Husband, ..	Dach, ..	Daghpo, ..	Chogha. ..
Wife, ..	Nar, yas, ..	Moonee, ..	Yolat. ..
Son,.. ..	Chung, ..	Boocha, ..	P,huslee-chung. ..
Daughter, ..	Cheeme, cheemet, ..	Pomo, pama, choogoo, .	Esree-chung. ..
Paternal Grandfather, ..	Tete, ..	Meme, ..	Meme. ..
Maternal ditto, ..	Boodoee, ..	Meme, ..	Meme. ..
Paternal Grandmother, ..	Tegow, ..	Apee, ..	Apee. ..
Maternal ditto, ..	Boodee, ..	Apee, ..	Apee. ..
Elder Brother, ..	Acho, ate, ..	Azho, ..	Acho. ..
Younger ditto, ..	Bya, ..	No, ..	Bya. ..
Elder Sister, ..	Apoo, reengs, ..	Azhee, nomo, tongmo, ..	Sheeng, sungmo. ..
Younger ditto, ..	Byach, ..	Namo, sungmo, ..	Bete. ..
Paternal Uncle, ..	Akoo, ..	Oogoo, ..	Akoo. ..
Maternal ditto, ..	Moma, ..	Ebee, azhung, ..	Azhung. ..
Paternal Aunt, ..	Nane, ..	Une,.. ..	Une. ..
Brother-in-law, ..	Shukpo, ..	Shukpo, mindokpo,..	Shukpo, ..
Mankind, ..	Mee, ..	Mee,.. ..	Mee. ..
Man, ..	Mee, choungmee, ..	Mee, pooja, chokton, ..	Mee. ..
Woman, ..	Chishmee, ..	Pomo, moonee, chouree, ..	Eshree. ..
Child, ..	Chung, ..	Tooboo, pooza, toogoo, ..	Chung. ..
Relations, ..	Ate-bya, ..	Poola, ..	Acho-bete. ..
Male, ..	Skeo, ..	Agoo, ..	P,huslee, p,hoosree. ..

ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEBURSKUD.
Female, ..	.. Moonch,	.. Ane, ..	.. Mun.
Maneater, male, ..	.. Rakshush,	.. Teenbo, sheenpo,	.. Rakshush, shoona.
Ditto, female, ..	.. Rukshunee,	.. Sheenmo, ..	.. Rakshunee.
Ghost, ..	.. Khoongts,	.. Notpa, ..	.. K, hoong.
Ferryman, ..	.. Taroo,	.. Taroo, ..	.. Taroo.
Carpenter or mason, ..	.. Oris, ..	.. Shingso, ..	.. Oris.
Shoemaker or weaver, ..	.. Chamung,	.. P, heeba, ..	.. Chamung.
Blacksmith, ..	.. Domung,	.. Zo, gara, ..	.. Domung.
Goldsmith, ..	.. Sonarus,	.. Moolzo, ..	.. Sonarus.
Merchant, ..	.. Bora,	.. Chongpun, ..	.. Chongpun.
Shepherd, ..	.. Palis,	.. Loogzhee, dokpo,	.. Palis.
Bird-catcher, ..	.. T, hut, heal,	.. ..	.. T, hut, heal.
Porter, ..	.. Chamung,	.. Sheebie, t, hee, ba,	.. Chamung.
Landholder, ..	.. Busin,	.. Misr, rukpo, dooa, ..	.. Busin.
Chief of a village, ..	.. Matus,	.. Lonbo, lasa, charus,	.. Matus.
A great man, ..	.. Damee,	.. Chidmo, ..	.. Shangnee.
Master, ..	.. Zeetus,	.. Noryotkun, ..	.. Zeetus, chookpo.
Servant, ..	.. Bando,	.. Labo, choonpa, ..	.. Lapa, choonpa.
Slave, ..	.. (None in Koonawur,)	.. Chuksis, goeul, yato,	.. ..
Trumpeter, ..	.. Hesee,	.. Bet, ha, ..	.. Kunalee, bajjee.
Trumpeter's wife, ..	.. ..	.. Bemo, ..	.. ..
Drummer, ..	.. Ningarchee, ..	.. ..	.. ..
Waiter, ..	.. Khidmutgar,	.. Zimoen, zimpon, ..	.. Khidmutgar.
Cook, ..	.. Botea,	.. Mazin, ..	.. Romdaree.
Vizier or wuzeer, ..	.. Bisht,	.. Kaloon, zongpoon, kalun,	.. Bisht, zompoon.
Interpreter, ..	.. ..	.. T, hoongchee, ..	.. Katpa.
Doctor, ..	.. Hubba,	.. Hubba, larzhee, ..	.. Hubba.

ENGLISH.	MILCHAN.	Б,НОТНА ОВ ТАНТАН.	T,НННУНСКУД.
Thief,	..	..	Chorus.
Beggar,	..	..	T,hoacheenee.
Enemy,	..	..	Shotrus.
Coward,	..	..	Bamgeo.
Friend,	..	..	Dost.
Liar,	..	..	Keakosa, koak, hola.
Horse postman,	..	..	..
Monk,	..	..	Gelong.
Nun,	..	..	Chomo.
Pilgrim,	..	..	K, hampa.
Head of a convent,	..	..	Lopon.
Scholar,	..	..	Lobtuk.
Inhabitant of the plains,	..	..	Neolee.
Ram,	..	..	Ram.
Luchmun,	..	..	Luchmun.
Seeta,	..	..	Seeta.
Kishun,	..	..	Kishun.
Debee,	..	..	Doolma.
Thakoor, of a temple,	..	..	Sangeas.
Bhugwan,	..	..	P, hakra.
Mahadeo,	..	..	Lopon.
Luchnee,	..	..	Zumala.
Lama,	..	..	Lamba.
Lamas with yellow caps,	..	..	Geloopa.
Ditto with red ditto,	..	..	Neengma.
Ditto with red clothes,	..	..	Dookpa.
A God, (Deota,)	..	..	La.
	Chorus,	Skoonma, koodma,	..
	Ooncheets,	Miltokh, rigin,	..
	Shotrus, beeor,	Madudpa, da,	..
	Bamgeo, boco, bameo,	..	..
	Dost,	Gonshe,	..
	Urkolis,	Zoodea,	..
	(None in Koonawur,)	Tazum,	..
	Gelong,	Gelong,	..
	Chomo,	Chomo, anee,	..
	K, hampa,	K, hampa,	..
	Gooroo,	Gooroo, lobun,	..
	Lobtuk,	Lobtuk,	..
	Neolee,	T, hamee,	..
	Ram,	Munee-pudma,	..
	Luchmun,	Kesur-k, higoo,	..
	Seeta,	Choojoo-dooboo,	..
	Kishun,	Eeshee-cheoorgeal,	..
	Debee,	Doolma,	..
	T, hakra,	Sangeas,	..
	P, ha,	Changra-zeeekh,	..
	Mahadeo,	Lopon,	..
	Zumala,	Zumala,	..
	Lamba, lumba,	Lamba,	..
	Geloopa, gelookpa,	Geloopa, Deegooma,	..
	Neengma,	Neengma, sakea,	..
	Dookpa,	Dookpa,	..
	Shoo,	La,	..

ENGLISH.	MILCHAN.	B, HOTEHA OR TARTAR.	T, HERBURSUD.
Animal,	Sheeo,	..	..
Tiger,	T, har,	.. Ta, chan,	.. T, har.
Leopard,	Seek,	.. Zik, see, seek,	.. Sudur.
Bear,	Hom,	.. Barge, tong,	.. Hom.
Horse,	Rung,	.. Tah,	.. Shung.
Bull,	Dumus,	.. Langoong,	.. Langoong, etong.
Cow,	Lang,	.. Pa, Palang,	.. Balang.
Ram,	Kool,	.. Mamo,	.. Brang, ma.
Sheep,	Khus,	.. Loog,	.. Soom.
Ass,	P, hoch,	.. Poon, boomoo, bongo,	.. P, hoch, p, hot.
Mule,	Teeo,	.. Te, teeo,	.. Teeoo.
He-goat,	Aj,	.. Rabo,	.. Keoot.
She-goat,	Bukur,	.. Rama,	.. La.
Yak, male,	Yak, yag,	.. Yakh, yag,	.. Yag, yak.
Ditto, female, .. [male,	Breemo,	.. Deemo,	.. Breemo.
Breed between Yak and Cow,	Zo,	.. Zo, zobo,	.. Zofo.
Ditto ditto, female,	Zomo, ..	.. Zomo, ..	.. Zomo.
Deer,	P, ho, ..	.. Na, ..	.. P, ho.
Deer, with large horns,	Skeen,	.. Keeng, nean,	.. Keen.
Ditto, small ditto, ..	Sboo,	.. Joo,	.. Boo,
Ditto, of another kind,	Kakrus,	.. Baral,	.. Tanmo.
Wild Goat,	Sar, ..	..	.. War, namo.
Musk Deer,	Roch,	.. Ropache, laba,	.. Rots.
Hog,	Soorus, soongur, chest,	.. Toorfa, phak,	.. Soongur.
Ditto, wild,	..	.. Reep, ha,	.. Reep, ha.
Dog.	Kooee,	.. K, hee,	.. Khooe.
Cat,	Peeshee,	.. Peela, pooshee,	.. Peeshee.



ENGLISH.	MILCHAN.	B, HOTEHA OR TARTAR.	T, HEBVUMSKUD.
Monkey, large, ..	Gohnus, ..	Teeo, ..	Gohnus.
Ditto, small, ..	Bundrus, ..	Sheeo, ..	Bundrus.
Sheep and Goats, ..	Zilung, ..	Choogma, ..	Chooma.
Mare, ..	Gonma, ..	Golma, ..	Gonma,
Colt, ..	Rung kachookts, ..	T, hooroo, ..	Shung kachook.
Young Ass, ..	P, ho kachookts, ..	Boomtoog, ..	P, hot kachook.
Wild Yak, ..	Dong, ..	Dong, ..	Dong.
Ditto Horse, ..	Keang, ..	Keang, ..	Keang.
Ditto Ass, ..	Goork hur, ..	Goork hur, ..	Goork, hur.
Pup, ..	..	K, heegoo, ..	K, hooekchung.
Kid, ..	..	Loogoo, ..	Kulat.
Monkey's Cub, ..	..	Teegoo, ..	..
Calf, male, ..	..	Peto, ..	Zochur.
Ditto, female, ..	..	Peto, ..	Moondlo.
Flock of Sheep, ..	..	Loogrung, ..	Lamasabala.
Hare, ..	Reehong, ..	Reehong, ..	Reehong.
Rat, ..	} Peeoo, ..	Peea, ..	Peeoo, peeoo.
Mouse, ..		..	..
Fish, ..	Muchus, ..	Neea, ..	Muchus.
Snake, ..	Sabas, ..	Dool, ..	Brool.
Frog, ..	Tipluk, ..	Balba, ..	Tipluk.
Porcupine, ..	Shae, ..	Toodoom, ..	Shur.
Centipede, ..	Zhachus, ..	Shunglaboo, ..	Shunglaboo, rangrabeeo.
Lizard, ..	Chemur, ..	..	Chunkla.
Grasshopper, ..	Sblen, ..	..	..
Locust, ..	Shelus, ..	..	Sherus.
Caterpillar, or maggot, ..	Hong, ..	Boo, ..	Boo.

ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEBURSKUD.
Fly,	Yung,	Dung,	Boeung.
Bee,	Wus yung,	D, hangoong,	Pranchee-beeang.
Firedly,	..	Mesokboo,	Mesungboo.
Bug,	..	..	Sootee.
Spider,	Sootee,	..	Dae-boeung.
Moth,	Rootux,	..	..
Flea,	Lach,	..	..
Butterfly,	Spooq, ..	Cheeshee,	Meetee.
Musquito,	Shoopeach,	Chabla, ..	Shoopeach.
Louse,	Chachee,	Koeung,	Koeung.
Bird,	Reek,	Sheek,	Shee.
Fowl,	Pea,	Cha,	Pea.
Hawk,	Kookree,	..	Kookree.
Pigeon,	Pazee, ..	T, ha,	Pazee.
Chukor,	Rapeea,	Mookoo, moogrun,	K, hurin.
Crow,	Teek, tig,	Takpa,	K, hure.
Kite,	Kak,	Kakse, karo, garok, p, horok,	Ka, p, horok.
Goose,	Goldus,	T, hangar,	Goldus.
Swan,	Arus, koorul,	{ Nangba, moorba, choopcha, } reegechamo,	Nangba.
Duck,	..	Toongtoong,	..
Peacock,	Geeltung,	Geeltung,	..
Head,	Morus,	Mebja, mapcha,	Mabja.
Crown of head,	Bul,	Go, ta,	Peesha.
Face,	Moling,	Tukchur,	Geatoor.
Forehead,	Sto,	Gontong,	Mamee.
Hair,	Pheea,	Tawa, tana,	P, heea.
	Kra,	Sha, g, ho,	Kra.



ENGLISH.	MILCHAN.	B, БОТБА OR TARTAR.	T, ТЭБДЭСКУД.
Eyelash,	Meekchung, mikhrong,	Mekhp, ho, menma,	Meekchung, mikhrong.
Rump,	Chongto,	Chongto,	Chongto.
Heel,	T, hongul,	Tinge, tingba,	T, hongul.
Waist,	Re, guchung, ko,	Kedpa,	Kedpa.
Skin,	Sha,	Pakhpa,	Pakhpa.
Joint,	Sanig,	Ching,	Chikh.
Breast,	Stook, stoo,	Tang, ning,	Keoo.
Belly,	Peting,	Todpa, p, hopa, topa,	K, hok, k, ho.
Back,	Pooshting,	Geap,	Geab.
Bladder,	Koopee,	Koopee, kopee,	Koopee.
Vein,	Seerung,	Sah,	Seerung.
Fat,	Chus, meez,	Cheeloo,	Cho.
Bone,	Harung,	Ropa, rooba,	Harung.
Marrow,	Goot,	Kang,	Kang.
Eyebrow,	Meekcham,	Meekcham,	Meekcham.
Blood,	Pulach,	T, hak,	Shooee.
Breath,	Dako,	T, hungchache, ..	Dako.
Thumb,	Motus-prach,	T, hebo, t, hedmoche,	Prach.
Hole of ear,	Kansooling,	Nughab,	Kanikee.
Pupil of eye,	Meeksil,	Pootlee,	Meekzoor.
Nostril,	Staksooling,	Nakoong,	Neoomedoeng.
Cheek,	Peeng,	Zingba, damba,	Dampa.
Armpit,	K, heeteeka,	Chingloun,	Keetlee.
Sole of foot,	Potlung,	Kangdil, kangba,	Kangt, hil.
Small of arm,	K, heeoots,	Langura,	La.
Hair of body,	Spoo,	Poo,	Poo.
Pudendum viris.	..	Lebe, kotoh,	..

ENGLISH.	MILCHAN.	B. НОТНА ОН ТАНТАН.	T. HEBURSKUD.
Pudendum mulieris,	.. Naeeng.	.. To, ..	.. Teba.
Navel ..	.. Pukat,	.. Teeba, teea,	.. Pukat.
Ankle, ..	.. Koangcheek,	.. Longmora, cho,	.. Pooshpang, yoogin.
Hollow below knee,	.. Chin, chibee,	.. Keengra,	.. Zoospung.
Urine, ..	.. Deung,	.. Chin, chibee,	.. Chinba.
Body, ..	.. Sheen,	.. Zoog, zookpo,	.. Loa, shesha, sim.
Liver, ..	.. Steeng,	.. Chinba,	.. Neel.
Heart, ..	.. ..	.. Loa, sim,	.. Takchur.
Testicle,	.. Steel, neel,	.. Lokhpa, lokpa,	.. Peepee.
Gums, ..	.. Ralpa,	.. Gil, neel,	.. Keoot.
Cue, worn by Chinese,	.. Peepee, yeboo,	.. Takchur,	.. Shokpa.
Woman's breasts,	.. K,heooch,	.. Numa, yeboo,	.. Toom.
Upper part of arm,	.. Pukrung,	.. Pomo, ..	.. Mekon.
Wing, ..	.. Lee, leech,	.. Shokpa,	.. Torung.
Egg, ..	.. Poornung,	.. Ghoo, ..	.. Geatur.
Tail, ..	.. Zool,	.. Gama, ..	.. Pool.
Cobweb,	.. Moling,	.. Takchur,	.. Shonung.
Cock's-crest,	.. Pool, ..	.. Pool, shookpa,	.. Peechoo.
Feather,	.. Shonung,	.. Chootoo, chooto, ..	.. Roocho, reecho.
Bird's-beak,	.. Pood, peechoo,	.. Aeebo, noma,	.. Rabung, doostee.
Nipple,	.. Root, ..	.. Racho, ..	.. Eef.
Cow's or Deer's horns,	.. Doostee,	.. Chadpo, dooshtee,	.. Pooch.
Sweat,	.. Neendrung,	.. Neet, ..	.. Gunoo.
Sleep,	.. Pooch, purung,	.. Zerba, ..	.. Khebung.
Swelling,	.. Gunung,	.. Bah, ..	
Goitre, ..	.. On, ..	.. Togree,	
Hunger,			

ENGLISH.	MILCHAN.	B, HOTERA OR TARTAR.	T, HEBBUNSKUD.
Thirst,	Cheesh, ..	.. Koomree, ..	.. Teekurbung.
Wound,	Mooheeta, p, hoor, ..	.. Shooa, ..	.. Ke.
Famine,	Unkalung, ..	.. Unkalung, ..	.. Unkalung,
Pain,	Chot, ho, todo, doshung, ..	.. Nacha, doongal, ..	.. Nabung, took, hung.
Pleasure,	Khoshee, ..	.. Dakin, ..	.. Khooshee.
Smell,	Ganum, ..	.. Deema, t, hema, ..	.. Deema.
Sneezing,	..	.. Reedba, ..	..
Kiss, ..	..	.. Pookh, ..	..
Spittle,	Tookung, ..	.. Cheema, ..	.. Kratee.
Love,	..	.. K, hunta, ..	..
Flavour,	..	.. Khamee, ..	..
Cough,	Choo, ..	.. Loodpa, ..	.. Gool.
Cubit,	Reen, ..	.. T, hoo, ..	.. Kroo.
Smoke,	Doomung, doobung, ..	.. Tootpa, doodpa, ..	.. K, hoo.
Stink,	..	.. K, bachucks, deema-ganba, ..	.. Deema-kochung.
Life,	Zeewa, ..	.. Tok, ..	.. Zeeco.
Truth,	{ Suchelee, deemung, nirbaning,	.. Dangpo, ..	.. Deemlo.
Theft,	K, hoocheo, choramung, ..	.. Kooa, ..	.. K, hootka.
Cold,	Liak, ..	.. Tangmo, ..	.. K, hatkeo.
Heat,	Tapung, zhang, ..	.. { Mede, dodmo, d, hoonma, donmo, ..	.. Kotra, donmo.
Fever,	Bok, ..	.. Rim, ..	.. Bok.
Justice,	Suchumee, ..	.. Tangpo, ..	.. Sucho.
Lie,	Urkolung, ..	.. Zoond, ..	.. Keko.
Knot,	Toonga, ..	.. Dootok, changdoo, ..	.. Toonga.
Merchandise,	Chong, ..	.. Chong, ..	.. Chong.

	MALOMAN.	B, HOGERA OR TARTAR.	T, MSHVESHKUD.
Baggage,	.. Lotpot,	.. Nor, chilak-pulukh,	.. Lotpot.
The Plains,	.. Neetul,	.. T,ha, geaghur,	.. Neetul.
Debt,	.. Reen,	.. Booloon, pooling,	.. Toa.
Security for a person,	.. Logonis,	.. Nemees,	.. Logonis.
Charm,	.. Stoongma,	.. Shooan,	.. Toonga.
Ascent,	.. Ring, tang,	.. Yer, kean, gen, yala,	.. Tang, lo.
Descent,	.. Shoon, zhup,	.. T,hoor,	.. T,hoor, yat.
Amusement,	.. Tumasha,	.. Tanmo,	.. Tanmo.
Abuse,	.. Galing,	.. Mnamo,	.. Galing.
Age,	.. Deem,	..	..
Boundary,	.. Seemung,	.. Sungum,	.. Seemung.
Top,	.. Beel,	.. K,hato, k,hatook,	.. K,hacheoot.
Bottom,	.. Po,	.. Yok,	.. Po.
Battle,	.. Rashim, dashim,	.. T,banmo, t,bookpa,	.. Mublo, breehbung.
Complaint,	.. Poocheem,	.. T,himtook,	.. Poocheem.
Country,	.. Bonung,	.. Rear, loongba,	.. Bonung.
Crack,	.. Rookts,	.. Chakpo,	.. Reesha.
Defeat,	.. P,hancheco,	.. Shooone,	.. P,hanning.
Fear,	.. Beang,	.. Zbeeg,	.. Gearbung.
Handful,	.. Sgar boong,	.. Baragung,	.. Roaring.
Hill,	.. Rung, runga,	.. La,	.. Yooa.
Loud noise,	.. Dumakatwado,	.. Ka-chinmo,	..
Delay,	.. T,hara,	.. T,hagring,	.. Keelo.
Middle,	.. Muzhung,	.. Zhoong,	.. Lutung.
Noise,	.. Shad,	.. Ka,	.. Meen.
Name,	.. Namung,	.. M,heen,	..
Peak,	.. Groocho,	..	..

ENGLISH.	MILCHAN.	B, HOTEBA OR TARTAR.	T, HEBURSKUD.
Plain,	.. Soldus,	.. T, hunga,	.. T, hunga.
Road,	.. Om,	.. Lam,	.. Om, am.
Rust,	.. K, hyung,	.. Ya,	.. K, hoeung.
Range,	.. D, hanee,	.. ..	.. ..
Song,	.. Geetang,	.. Loo,	.. Gerib, greb.
Bundle,	.. Books,	.. Bokcha,	.. Book, shateen,
Fold,	.. Doon,	.. Bak,	.. Ba.
Time,	.. Karung, detra,	.. Lal, lan, chot, ..	.. Karung,
Ashes,	.. Buspa,	.. T, hawa, koktul,	.. Miling, -bating.
Hole,	.. Doeeng,	.. Meegung, meeoong,	.. Doeeng.
Service,	.. Dang, chakree,	.. Yokpa, makh, ..	.. Lapa.
Order,	.. Hookum,	.. Ka,	.. Hookum,
Precipice,	.. Donk, hung,	.. ..	.. Donk, hung.
Trap,	.. Lurkee,	.. ..	.. ..
Medicine,	.. Shel,	.. Mun,	.. Mun.
Cast,	.. Zat,	.. Rikh,	.. Zat.
Small Hill,	.. Danee,	.. Gongo, gankha,	.. ..
Shadow,	.. Soot,	.. Teema, deep, ..	.. Silib.
Spark, ..	.. Keeang,	.. Mechak,	.. Keeang.
Step, ..	.. Goumpa,	.. Gompa,	.. Gompa.
Thing, ..	.. Bust,	.. Nor, zok,	.. Chongzo, bus.
Business,	.. Kamung,	.. Lakha, laha, ..	.. Len.
Word,	.. Batung,	.. Kacha, tam, kat,	.. Kamchee.
Place,	.. Pra, pusrung, zaga,	.. Te, nasa dusa, dungsa,	.. Polung, jat, ho.
Victory,	.. Gyleeo, zeetecho,	.. Gealpa,	.. Gealbung.
Language,	.. Buzum,	.. Doonma,	.. Buzum.
Something,	.. Chood, chut, t, booch,	.. Chang, mana, ..	.. Khulee, k, hakashe, k, hao.



ENGLISH.	MILCHAM.	B. MOTEA OR TANTAN.	T. MEBURKUD.
Mortar,	..	.. Zing, abing,	..
Price,	.. Molung,	.. Gong, rin, reeng,	.. Molung.
Dream,	..	.. Meengmun,	..
Custom,	.. Put, hung,	.. Lookh, t, heem,	.. Put, hung.
Hour, (about 20 minutes,)	.. Gurung,	.. Choosut,	.. Gurung.
Colour,	.. Rung,	.. Marchoo,	.. Rung.
Light of Fire,	.. Deebung,	.. Milche, marme,	.. Deewung.
Wick of Lamp,	.. B, hatee,	.. Dookaur, dongaur,	.. Dongaur.
Brink,	.. Beel,	.. Dul,	.. Dam.
Mud,	.. Kaluk, ins, yarung,	.. Dambuk,	.. Kaluk.
Rock,	.. Rooning,	.. P, hulung,	.. T, hol.
Stone,	.. Rng, rak,	.. Doa,	.. Ra.
Pebble,	.. Rak,	.. Tochoong, changpo-doa,	.. Rak.
Slate,	.. Pan,	.. Pan,	.. Pan.
Sand,	.. Balung,	.. Tecoo,	.. Balung.
Seed,	.. Beeung,	.. Toogmin, songun,	.. Peezud, sangun.
Burden,	.. Barung,	.. K, hooroo,	.. K, hooroo.
Field,	.. Reem,	.. Zaeeng,	.. Ree, reem.
Corner,	.. Zir,	.. Doo,	.. Zoor.
Wall, side,	.. Beet,	.. Cheekpa,	.. Beeting.
Sun,	.. Yoone, yoonek,	.. Neema,	.. Nee.
Moon,	.. Gulsung,	.. Dagar,	.. Gulsung.
Star,	.. Skara,	.. Karma,	.. Karma.
Moon-light,	..	..	..
Thunder,	..	.. Took, dook, doong,	.. Goorgooree.
Lightning,	..	.. Longmal, loghmur,	.. Bizhoong.
Earthquake,	..	.. Sangool,	.. Sangool.

ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEBBESKUD.
Eclipse,	.. Gronung,	.. Zanjeen,	.. Gronung, rowa.
Rainbow,	.. Teerameets,	.. Zheazun, sheen,	.. Moorung-moortee.
Cloud,	.. Zhoo,	.. Teen,	.. Zhoo, deengma.
Wind,	.. Lan,	.. Langda, hoor,	.. Lan.
Fire,	.. Me,	.. Me,	.. Me.
Air,	.. Hash,	.. ..	.. ..
Earth,	.. Matung, sho,	.. Sakea, sa, sucha,	.. Matung.
Sky,	.. Surgung,	.. Nam,	.. Nam.
Ice,	.. Shanung,	.. Golchuks,	.. Shanung.
Frost,	.. Pagrum, pugle,	.. Keakh,	.. Shanutpung.
Hail,	.. Shoroo,	.. Shoree,	.. Shoroo.
Snow,	.. Pum, pung, pom,	.. K, ha,	.. Ung.
Rain,	.. Rodung, doeung,	.. Chirba,	.. Rodung, mookpa.
Spring,	.. Renum,	.. Peetka,	.. Gendo, goondo.
Winter,	.. Goon,	.. Dang-medokh, goonga,	.. K, hutkeo.
Autumn,	.. Charmee,	.. Tonga,	.. Sheldo.
Rainy season,	.. Shul,	.. Yarka, tonga,	.. Sheldo.
North,	.. T, hoad, reeng, delung,	.. Zhung,	.. Zhung.
South,	.. Shoong, jak, hung,	.. Zampooling,	.. Zampooling.
East,	.. Nes,	.. P, hala, shur,	.. Dooroo, shur.
West,	.. Ning,	.. P, hurka, nook,	.. Dooroor, nook.
North-west,	.. ..	.. ..	.. Leengchoong.
Village,	.. Deshung,	.. Yool,	.. Deshung.
House,	.. Keem, keoom,	.. K, hangba, seekoong,	.. Keoong, keoom.
Cow-house,	.. K, hoorung,	.. Loogra,	.. Bong.
Cottage,	.. Shundung,	.. Reezhing,	.. Shurnung.
District,	.. K, hoodung,	.. K, hoodung,	.. K, hoodung.

ENGLISH.	MILCHAN.	B. NOTEA OR TARTAR.	T. HEBURSKUD.
Subdivision of a District,	.. Goree,	.. Chookhso,	.. Guree.
Fort,	.. Gorung,	.. K,hur,	.. Gorung.
Board,	.. Ro, p,hur,	.. Pangle,	.. Chaplung.
Post, Pillar,	.. T,hungung, t,hungmung,	.. Ka,	.. Tukh.
Ladder,	.. Cham,	.. Sanga,	.. Sanga.
Arch,	.. Togung,	.. Rupsul,	.. Teenul.
Beam,	.. D,harung, borning,	.. T,hogee-doongma,	.. Bororing.
Rafter,	.. Zhuldarung,	.. Daloo, duloo,	.. Zhuldarung.
Door,	.. Dwaring, beetang,	.. Go, seekpa,	.. Peetung.
Window,	.. Boning,	.. Karkum,	.. Boneet.
Door-post,	.. Cheekree,	.. Ribjee,	.. Ribjee.
Chain for fastening door,	.. Hoorung,	.. Golduk,	.. Golda.
Hook for ditto ditto,	.. Chootz,	.. K,hoozor, geeling,	.. K,hoozor.
Shop,	.. Hatee,	.. T,hom,	.. Hatee.
Flat Roof,	.. Moolt,hung,	.. K,hadik,	.. Cham, kheam.
Sloping ditto,	.. Chuprung,	.. Tang, t,hok,	.. Chuprung.
Temple,	.. Kot,hee,	.. P,hobrung,	.. Kot,hee, katarung.
			.. Choring.
Flag,	.. Darchut,	.. Durche, darboche,	.. Darchut.
Garden,	.. Sharung,	.. Mendok-doomra,	.. Sharung.
Hedge,	.. Chir,	.. ..	.. Chir.
Dyke,	.. During, d,huno,	.. Cheekpa,	.. During.
Upright posts for grapes,	.. Stoong,	.. ..	.. Toong, tukh.
Arbour for ditto,	.. Bashung,	.. ..	.. Bashung.
Year,	.. Bursung,	.. Lo,	.. Bursung.
Month,	.. Gol,	.. Daba, dawa,	.. La,
Day,	.. Dear, laee,	.. Neema zam, shakpo, za,	.. Dear, zhangma.

ENGLISH.	MILCHAM.	BHOTRA OR TARTAR.	THERBUNSKUD.
Next Year,	.. Hednia bursung,	.. Zegh, zhangma,	.. Orche.
Last ditto,	.. Noling bursung,	.. Nungbur,	.. Noning.
This ditto,	.. Toling bursung,	.. Dalo,	.. Thoning.
Noon,	.. Adung-lace,	.. Neema-p,he,	.. Near.
Midnight,	.. Adung-rating,	.. Chan-p,he,	..
Night,	.. Rating,	.. Chanmo, chan, gongmo,	.. Neezhoorpung.
Sunrise,	.. Zila,	.. Neema-abur,	.. Neegeootpung.
Sunset,	.. Reda,	.. Neema-kea,	.. Numutre.
Morning,	.. Somsee, sum, sangodoo,	.. Gnara,	.. Namberbung.
Evening,	.. { Toora, toorung, shoopo,	.. Gokhmo, chan,	..
	.. { shooobux, ..	..	.. Diring.
To-day,	.. Toro, tole,	..	.. Yangto.
Yesterday,	.. Me,	..	.. Dookeang.
Day before Yesterday,	.. Ree,	..	.. Aeero, yoor, guyro.
To-morrow,	.. Nuuum,	.. A, niringana,	.. Meengtea.
Day after to-morrow,	.. Romee,	.. Nam, nang,	.. Shildodear-abung.
Long Day,	.. Shul,	.. Neema-ringbo,	.. Cheegteet-dear.
Short ditto,	.. Goon,	.. Neema toogoon,	.. Choo.
Water,	.. Tee,	.. Choo, ..	..
River,	.. Sumudrung,	.. { Sangpo, mukung, khampa,	.. Sumudrung, sampoo.
		.. sampoo,	..
Rivulet,	.. Garung,	.. Dokpo, loongba, tokpo,	.. Noongpa.
Well with stone spout,	.. Baee,	.. Chooling,	.. Baee.
Ditto with wooden ditto,	.. Choo,	.. Chooling, tarebe,	.. Choo, wa.
Ditto for washing clothes,	.. Goot, hoo,	.. Thoma,	.. Yoor, goona.
Pond,	.. Koonung,	.. Ziang,	.. Cho.

ENGLISH.	MILCHAN.	B, HOTEHA OR TARTAR.	T, HEBURSKUD.
Lake,	.. Cho,	.. Cho,	.. Cho.
Canal,	.. Koolung,	.. Yooba, yoorā, ..	.. Yoor.
Strong Current, ..	.. Teelee,	.. Choang, shookh,	.. Shookh.
Skin for crossing rivers,	.. Mushkee,	.. Kelpa,	.. Kelpa.
Drop,	.. Choktee,	.. Soora, t, hikpa, ..	.. Choktee, chokchee.
Fog,	.. Dooceeng,	.. Mokhpa,	.. Mokhpa, mokpa.
Small Drops, ..	.. Oshung,	..	.. Zilba.
Wooden Bridge,	.. Tsam,	.. Samba, zum, ..	.. Zampa.
Rope,	.. Turung,	.. Took, suzum, ..	.. Twarung.
Tree,	.. Botung,	{ Tam, shingnokh, pang, shing- dong, tongpo,	} Botung.
Bush,	..	.. Dongpo,	.. Sul.
Forest,	.. Bunung, kunarung,	.. Rega,	.. Bonung.
Bark,	.. But, bur,	.. Konpa,	.. K, holub.
Branch,	.. Yulga,	.. Yulga,	.. Yulga.
Leaf,	.. Putlung, putrung,	.. Lep, laptee, loma,	.. Putlung.
Root,	.. Zhilung,	.. Pudugh,	.. Zhilung.
Wood,	.. Sheeng,	.. Sheeng,	.. Sheeng.
Pine,	.. Kelmung, ryung, leem,	.. Geam,	.. Geam.
Pine, Neora,	.. Ree, shungtee, ..	.. Kuminche, koneeunchē,	.. Ree, reet.
Birch,	.. Shak,	.. Shakpan, toghar, takpa,	.. Shooput, shukh.
Oak,	.. Broo, bure,	..	..
Poplar,	.. Lam, lanba, langba,	.. Langba,	.. Mughul.
Large Juniper, ..	.. Shoor,	.. Shookpa,	.. Shookoo, shoorpa.
Creeping,	.. T, hiloo, bidelgung,	.. P, huloo, pama, ..	.. Pama.
Another sort, ..	..	.. Bettir,	..
Gooseberry,	.. Neange,	..	.. Neange.

ENGLISH.	MILCHAN.	B, БОТРА OR ТАТАР.	T, ТЭВУСКУД.
Bamboo, ..	.. Kokuk, ..	.. Neooma, ..	.. Koka.
Reed, ..	.. Damboo, ..	.. Neoogoo, ..	.. Pee.
Thistle, Thorn, ..	.. Cho, koolchoo, ..	.. Chirna, ..	.. Choa.
Flower, ..	.. Oo, ..	.. Metok, ..	.. Mento.
Fern, ..	.. Sdoo, ..	.. ..	.. ..
Hemp, ..	.. Kas, ..	.. ..	.. Bungero.
Cotton, ..	.. Kapa, ..	.. Rapal, ..	.. Kapa.
Grass, ..	.. Chee, ..	.. Sa, ..	.. Chee.
Straw, ..	.. Boosung, ..	.. P,hooma, ..	.. Boogoo.
Fruit, ..	.. Sho, ..	.. Dulboo, ..	.. Oosho.
Apple, ..	.. Pale, palek, ..	.. Kooshoo, ..	.. Kooshoo, tahung.
Apricot, ..	.. Chool, choolee, ..	.. Choolee, boorzha, ..	.. Choolee, boorzha.
Pear, large, ..	.. Birus, ..	.. ..	.. ..
Ditto, small, ..	.. Leech, ..	.. ..	.. Leet.
Peach, large, ..	.. Adogung, kutearo, ..	.. ..	.. ..
Ditto, small, ..	.. Rek, beme, ..	.. ..	.. Rok.
Grape, Raisin, ..	.. Dak,hung, dahung, ..	.. ..	.. Goon.
Walnut, ..	.. Ka, ..	.. Goon, goondoom, ..	.. Kat.
Horse Chestnut, ..	.. K,hunour, poo, ..	.. Tarka, ..	.. Poo.
Lime, ..	.. Sab, ..	.. Poo, ..	.. ..
Stone of Apricot, ..	.. Remoo, ..	.. Sah, ..	.. Remo.
Grain, ..	.. Choa, ..	.. Rakche, ..	.. Broo.
Wheat, ..	.. Zud, jot, zot, ..	.. Jukhpe, ..	.. Rozud.
Panicum Tartaricum, ..	.. Bras, ..	.. Do, ..	.. Brao.
Ditto Emarginatum, ..	.. Ulgo, ..	.. Tao, ..	.. Keamre.
Amaranthus Anardhana, ..	.. Dankur, ..	.. Geamda, geamk,heer, ..	.. Chilae.
Paspalum Scrobiculatum, ..	.. Kodro, ..	.. Beet,hoo, ..	.. Kots, kotro.
		.. Koto, ..	.. ..

ENGLISH.	MILCHAN.	B, БОТНА OR TARTAR.	T, ТЭВУРМУД.
Hordeum Cœleste,	.. Ooa, ooe, ..	.. Neeco, ..	.. Tingzud.
Barley, ..	.. Tuk, soom, ta, ..	.. Soa, ..	.. Zut.
Pease, ..	.. Pytung, ..	.. Tunma, t,hulma, ..	.. Pytung.
Beans, ..	.. Chustun, ..	.. ..	.. ..
Rice, ..	.. Ral, ..	.. Da, ..	.. Rul.
Flour, ..	.. Cheesang, ..	.. ..	.. ..
Flour of Wheat,	.. K,hunukung, ..	.. Pukhfe, ..	.. K,hunukung.
Parched Grain,	.. Yoot, ..	.. P,he, sũmba, ..	.. Yooet.
Cucumber, ..	.. Kookree, ..	.. ..	.. ..
Turnips, ..	.. Shagur, ..	.. Neoongma, yoongma, ..	.. Shagur.
Greens, ..	.. Skand, skan, ..	.. Chunma, ..	.. Kan.
Red Pepper, ..	.. Peeplee, ..	.. Soorpunsa, ..	.. Peeplee.
Ginger, ..	.. Shont, ..	.. Chega, ..	.. Chega.
Opium, ..	.. P,heemee, ..	.. K,hercha, ..	.. P,heemee.
Onions, ..	.. Chong, peeaz, ..	.. Chong, ..	.. Chong.
Garlick, ..	.. Lostung, ..	.. Gokhpa, ..	.. Lafoo.
Wild Garlick, ..	.. Goze, ..	.. Koche, ..	.. Cheeskun.
Meat, ..	.. T,hoopa, ..	.. Sha, ..	.. Sha.
Food, ..	.. Zamek, zamo, ..	.. T,haktok, ..	.. Zabung.
Sugar, fine, ..	.. Shakrung, ..	.. Kara, ..	.. Shakrung.
Sugar, coarse, ..	.. Gooram, ..	.. Gooram, ..	.. Gooram.
Butter, ..	.. Mar, ..	.. Mar, ..	.. Mar.
³ Milk, ..	.. K,heerung, b,herung, ..	.. Oma, ..	.. Pel.
⁴ Butter-milk, ..	.. Bot, rat, ..	.. Tara, ..	.. Dara, botee.
Curdled ditto, ..	.. Doeng, ..	.. Sho, ..	.. Pil, keasp,hel.
Bread, ..	.. Bot, ..	.. Tigir, takree, ..	.. Tagree, rot.
Honey, ..	.. Wus, ..	.. D,hang, tangsee, ..	.. Pranchee.

ENGLISH.	MILCHAN.	B, HOTKA OR TARTAR.	T, HEBURSKUD.
Tea,	.. Boj, cha,	.. Cha,	.. Cha.
Intoxicating Spirits,	.. Rak, h,	.. Arak,	.. Rak, h.
Wine,	.. Shoo,	.. Chang-chamo, ..	.. Shoodung, yoo.
Tobacco,	.. Tumakoo, gurak, hoo,	.. Tumak, tumang,	.. Tumakoo, gurak, hoo.
Snuff,	.. Nusar,	.. Natik,	.. Nusar.
Salt,	.. Tsa,	.. Tsa,	.. Tsa.
Saltpetre,	.. Zunsao, shora,	.. Shora,	.. Shora.
Sulphur,	.. Gunik,	.. Moozhe,	.. Moozee.
Zedoary,	.. Nirbees,	.. Ponga,	.. Nirbees.
Oil,	.. Telung,	.. Markoo,	.. Mat, hee.
Bees' Wax,	.. Seetung,	.. Tasing, tasil, ..	.. Seetung.
Turpentine,	.. Ch, hee,	.. ..	.. Ch, hee.
Musk,	.. Katrung,	.. Larzee, lerzee,	.. Katrung.
Ditto, pod of,	.. Beena, bena,	.. Ladoom,	.. Bena.
Glue,	.. Silesh,	.. Peen,	.. Peen.
Poison,	.. Beeshung,	.. Dook, tok,	.. Beeshung.
Cap,	.. Tepung, tobung,	.. Shao, shamo, teebee,	.. Tepung.
Turban,	.. Pag,	.. T, hot,	.. Pak.
Shoe of Blanket,	.. Spon,	.. Lam,	.. Bulzhum, balzun.
Ditto of Leather,	.. Poolre, kooshera,	.. Koosheeree, kufsha,	.. P, honee.
Caps worn by Chinese,	.. ..	.. Menchook, b, hoorko,	.. ..
Large Blanket,	.. Doree,	.. Zan, zango,	.. Doree.
Small ditto, ..	.. Chadur, yanglees,	.. Neanglook, neangnoos,	.. Neangnoos.
Garment of Blanket,	.. Chooga,	.. Chooga,	.. Chooba.
Ditto of Sheepskin,	.. Porin,	.. Lakpa,	.. Lakpa, laga.
Ditto of Goat's-hair,	.. K, heear, k, hercha,	.. K, heear,	.. K, heear.



ENGLISH.	MILCHAN.	B.НОТКА OR TARTAR.	T.НЕСУСКУД.
Trowsers, ..	.. Sootun,	.. { Nameea, kangnum, toorma, ..	.. Sootun.
Gloves, ..	.. Goozub,	.. Lakshoop, ..	.. Goozub.
Any kind of Garment,	.. Unga,	.. Koh, ..	.. Gola.
Stocking part of Boot,	.. P,heenpa,	.. Pingpa, ..	.. Peengpa.
Garters, ..	.. Bongre,	.. Lamdokh, ..	.. Lamdokh.
Boots, ..	.. Uluk,	.. Lam, ..	.. Lam.
Stockings, ..	.. Tingbol,	.. Tingbol, ..	.. Tingbol.
Clothes, ..	.. Gas,	.. Doghluk, goluk,	.. Goluk, goloo, gola.
String for Trowsers,	.. Choorkoo,	.. Rugboo, ..	.. Sirko.
Girdle, Waistbelt,	.. Gachang,	.. Kerakh, kera,	.. Puret.
Pocket, ..	.. K,heesa,	.. Chanda, ..	.. K,heesa.
Carpet, ..	.. ..	.. Gat,hao, ..	.. ..
Handkerchief, ..	.. Loongee,	.. Loongee, t,halong,	.. Loongee.
Felt, ..	.. Numda, p,heenpa,	.. Numda, cheengpa,	.. P,heengpa, numda.
Cloth, ..	.. Kupra,	.. Ra, ..	.. Ra.
Clasp for Gown,	.. Peechook,	.. Peechoo, ..	.. Peechook.
Earrings, ..	.. Duretoo, gukloo, moorkee,	.. Sogong, konta,	.. Sogong, kokhroo.
Beads, ..	.. P,hrea,	.. Motpukun, ..	.. P,hrema.
China Silk, ..	.. Geanjee, goshen,	.. Geanjee, magoshin,	{ Geanjee, tankama, doog- reema, k,hurlona.
Cowrie Shells, ..	.. Kooreets,	.. Roonboo, ..	.. Geoen, gentz.
Ring, ..	.. Moodee, kaonr,	.. Soortook, ..	.. Laksub.
Bracelets, Anklets,	.. Daglo,	.. Doogoo, ..	.. Daklo.
Wool, ..	.. Chum,	.. Pul, bul, ..	.. Cham, chum.
Ditto of Sheep,	.. Beang-chum,	.. Chung-bul, ..	.. Beang-chum.
Worsted, ..	.. Ra,	.. Kootpa, nalma,	.. Bee.

ENGLISH.	MILCHAN.	B, HOTEBA OR TARTAR.	T, HEBURSKUD.
Rope, ..	T, hakpa, ..	T, hakpa, ..	T, hakpa. ..
Shawl Wool with hair, ..	Lana, ..	Lena, ..	Lena. ..
Ditto without ditto, ..	K, hulchukhs, ..	K, hulchukh, ..	Kulchukh. ..
Hair among Shawl Wool, ..	Robung, ..	Ral, ..	Ral. ..
Yak's Hair, ..	K, holoo, ..	Sedpa, ..	Sedpa. ..
Goat's ditto, ..	Robung, ..	Ral, ..	Ral, robung. ..
Twine, ..	Shagro, reet, ..	Rakoot, ..	Ree. ..
Thread, ..	Bat, ..	Doongsur, ..	Bat. ..
Tent of Cloth, ..	Tumboa, ..	Koor, goor, ..	Tumboa. ..
Ditto of Yak's hair blanket, ..	Tumboa, ..	Rebo, ..	Rebo. ..
Cow's leather, ..	Tulung, ..	Koa, ..	Tal, pok. ..
Goat's ditto, ..	K, hool, ..	K, hool, ..	K, hool, pukhpa. ..
Saddle, ..	Shga, ..	Ga, ka, ..	Ga. ..
Bridle, ..	Shtap, ..	Shap, ..	Tap. ..
Stirrup, ..	Yopchun, ..	Pop, yop, ..	Yopchun, yopchen. ..
Umbrella, ..	Chutrung, ..	Seera, seeleea, ..	Seeleea, chutrung. ..
Walking Stick, ..	Choongma, ..	D, hekpa, pirka, geookpa, ..	Choonga. ..
Whitewash, ..	Cheet, ..	Karchee, ..	Gooroo. ..
Charcoal, ..	T, ho, ..	Shola, ..	Sola. ..
Mica, ..	Chiklim, ..	..	..
Convent for Monks, ..	K, hatg, honpa, ..	G, honpa, goomba, ..	G, honpa. ..
Back-basket, ..	Koting, keeda, ..	Konba, ..	Kotee. ..
Convent for Nuns, ..	Chomoling, ..	Chomoling, ..	Chomoling. ..
Small Table, ..	Chokse, ..	Chokse, ..	Chokse. ..
Picture, ..	Lareeks, ..	Labreek, ..	Labreek. ..
Sticks for giving light, ..	Sang, ..	Mezhogh, ..	Mesung. ..
Cart, ..	Gadee, ..	Sheta-k, holo, ..	Gadee. ..

ENGLISH.	MILONAN.	B, HOTEHA OR TANTAR.	T, HEBURAKUD.
Palanquin,	.. Palkee,	.. P, hepchang, geokchang,	.. Palkee.
Fire-place,	.. Meling,	.. T, hap,	.. Meling.
Spindle for twisting Worsted,	.. Koroo,	.. K, heeree,	.. P, hang.
Handmill,	.. Gotung,	.. Rantak, randa,	.. Got, hung.
Watermill,	.. Tee-gotung,	.. Chootakh,	.. Tee-got, hung.
Lid,	.. Peedung,	.. Gum,	.. Gum.
Pole of Tent,	.. T, hungung,	.. Goolkeookh,	.. Birk, ha.
Wooden Pin,	.. Poorts,	.. P, hoorba,	.. P, hoorba.
Lamp,	.. Deebung,	.. Chonme,	.. Deebung.
Looking Glass,	.. Ashoo,	.. Melong,	.. Chokee, ashoo.
Comb,	.. Kungt, hung,	.. Soa,	.. Shoir.
Stone Mortar,	.. Kaning,	.. Doltok, koolmo,	.. Koolmo.
Pair of Scales,	.. Pore,	.. Pore, neagha,	.. Pore.
Trap,	.. Lurkee,	.. ..	..
Ball,	.. Butlas,	.. Reelbo,	.. Potokh.
Bag,	.. P, hut, t, holee,	.. P, hut,	.. P, hut.
Foot of Table,	.. B, hung,	.. Kangba,	.. B, hung.
Skin for Flour,	.. K, hool,	.. K, hoolche, kealba,	.. K, hool.
Spectacles,	.. Pistow,	.. Migma,	.. Migma.
Granary of Wood,	.. Oorch,	.. ..	.. Sheengmung.
Box,	.. Dabee,	.. Gamchoong,	.. Gamchoong.
Ditto for Papers,	.. Koteech,	.. Eegum,	.. Grom, eegum.
Cross-bow,	.. Goon,	.. ..	..
Trunk,	.. Kot,	.. Zuma, gum,	.. Gum.
Bed,	.. Manzo,	.. Manzo,	.. Manzo.
Glass,	.. Sheeshee,	.. Shel,	.. Sheeshee.
Pellet-bow,	.. Shungum,	.. Dankong,	.. Shankong.

ENGLISH.	MILCHAN.	B, HOTEBA OR TARTAR.	T, HEBURSKUD.
Rope, ..	T, hakpa, ..	T, hakpa, ..	T, hakpa. ..
Shawl Wool with hair, ..	Lana, ..	Lena, ..	Lena. ..
Ditto without ditto, ..	K, hulchukhs, ..	K, hulchukh, ..	Kulchukh. ..
Hair among Shawl Wool, ..	Robung, ..	Ral, ..	Ral. ..
Yak's Hair, ..	K, holoo, ..	Sedpa, ..	Sedpa. ..
Goat's ditto, ..	Robung, ..	Ral, ..	Ral, robung. ..
Twine, ..	Shagro, reet, ..	Rakoot, ..	Ree. ..
Thread, ..	Bat, ..	Doongsur, ..	Bat. ..
Tent of Cloth, ..	Tumboa, ..	Koor, goor, ..	Tumboa. ..
Ditto of Yak's hair blanket, ..	Tumboa, ..	Rebo, ..	Rebo. ..
Cow's leather, ..	Tulung, ..	Koa, ..	Tal, pok. ..
Goat's ditto, ..	K, hool, ..	K, hool, ..	K, hool, pukhpa. ..
Saddle, ..	Shga, ..	Ga, ka, ..	Ga. ..
Bridle, ..	Shtap, ..	Shap, ..	Tap. ..
Stirrup, ..	Yopchun, ..	Pop, yop, ..	Yopchun, yopchen. ..
Umbrella, ..	Chutrug, ..	Seera, seeleea, ..	Seeleea, chutrug. ..
Walking Stick, ..	Choongma, ..	D, hekpa, pirka, geookpa, ..	Choonga. ..
Whitewash, ..	Cheet, ..	Karchee, ..	Gooroo. ..
Charcoal, ..	T, ho, ..	Shola, ..	Sola. ..
Mica, ..	Chiklim, ..	..	..
Convent for Monks, ..	K, hatg, bonpa, ..	G, honpa, goomba, ..	G, honpa. ..
Back-basket, ..	Koting, keeda, ..	Konba, ..	Kotee. ..
Convent for Nuns, ..	Chomoling, ..	Chomoling, ..	Chomoling. ..
Small Table, ..	Chokse, ..	Chokse, ..	Chokse. ..
Picture, ..	Lareeks, ..	Labreek, ..	Labreek. ..
Sticks for giving light, ..	Sang, ..	Mezhogh, ..	Mesung. ..
Cart, ..	Gadee, ..	Sheta-k, holo, ..	Gadee. ..

ENGLISH.	MILONAN.	B,НОТЕНА OR TARTAR.	T,ТЕНБУРСКУД.
Palanquin,	Palkee,	P,hepchang, geokchang,	Palkee.
Fire-place,	Meling,	T,hap,	Meling.
Spindle for twisting	Koroo,	K,heeree,	P,hang.
Worsted,	Gotung,	Rantak, randa,	Got,hung.
Handmill,	Tee-gotung,	Chootakh,	Tee-got,hung.
Watermill,	Peedung,	Gum,	Gum.
Lid,	T,hungung,	Goolkeookh,	Birk,ha.
Pole of Tent,	Poorts,	P,hoorba,	P,hoorba.
Wooden Pin,	Deebung,	Chonme,	Deebung.
Lamp,	Ashoo,	Melong,	Chokee, ashoo.
Looking Glass,	Kungthung,	Soa,	Shoir.
Comb,	Kaning,	Doltok, koolmo,	Koolmo.
Stone Mortar,	Pore,	Pore, neagha,	Pore.
Pair of Scales,	Lurkee,	..	..
Trap,	Butlas,	Reelbo,	Potokh.
Ball,	P,hut, t,holee,	P,hut,	P,hut.
Bag,	B,hung,	Kangba,	B,hung.
Foot of Table,	K,hool,	K,hoolche, kealba,	K,hool.
Skin for Flour,	Pistow,	Migra,	Migra.
Spectacles,	Oorch,	..	Sheengmung.
Granary of Wood,	Dobee,	Gamchoong,	Gamchoong.
Box,	Koteech,	Eegum,	Grom, eegum.
Ditto for Papers,	Goon,	..	..
Cross-bow,	Kot,	Zuma, gum,	Gum.
Trunk,	Manzo,	Manzo,	Manzo.
Bed,	Sheeshee,	Shel,	Sheeshee.
Glass,	Shungum,	Dankong,	Shankong.
Pellet-bow,	..	..	..

ENGLISH.	MILCHAN.	B, БОТБА OR TARTAR.	T, ТЭББУРСКУД.
Pellet, ..	.. Shung, ..	.. Dochoong, ..	.. Shungra.
Hooka, ..	.. Chilum, hooka, jajree,	.. Hooka, ..	.. Hooka.
Chillum, ..	.. T, hotee, ..	.. Top, ..	.. T, hotee.
Surposh, ..	.. Boodnee, ..	.. K, hachot, ..	.. Chilum, k, hop.
Hooka Snake, ..	.. Nalo, ..	.. Nalee, ..	.. Nalee.
Smoking Pipe, ..	.. Gungsa, ..	.. Gungsa, k, hungsa,	.. Gangcha.
Sea Shells, ..	.. ..	.. Daba, neemsa, ..	.. ..
Rupee, ..	.. Roopee, ..	.. Mool, ..	.. Roopee.
1 Ditto, ..	.. Eet roopea, ..	.. Mool-see, mool-cheek,	.. Tee-roopee.
2 Ditto, ..	.. Neesh roopea, ..	.. Mool-nee, ..	.. Neshee roopea.
3 Ditto, ..	.. Soom roopea, ..	.. Mool-soom, ..	.. Soom roopee.
4 Ditto, ..	.. Delee, ..	.. Tangsa, tanka,	.. Delee.
Penny, ..	.. Dubwa, ..	.. Dubwa, ..	.. Dubwa.
Halfpenny, ..	.. Dela, ..	.. ..	.. Dela.
2 to 4 Annas silver coin,	.. Tumasha, paolee,	.. Zhou, geow, ..	.. Timashee, paolee.
Book, ..	.. Pot, hee, ..	.. Lukpum, potee,	.. Chogee-potee.
Letter, ..	.. Egeee, kuglee, kagulee,	.. Egeee, eezookh,	.. Eege, akhrung, kuglee.
Paper, ..	.. Kukalpat, ..	.. Shoogoo, ..	.. Therik, shoogoo.
Pen, ..	.. Nookdo, ..	.. Denyon, dingeo, deoon,	.. Neookshing,
Ink, ..	.. Seeahee, ..	.. Naksa, sirl, ..	.. Naksa.
Inkstand, ..	.. Mushajun, ..	.. Nakoong, ..	.. Nakoong, nushajun.
Written Paper,	.. Eezhe, ..	.. Eezhe, ..	.. Eezhe.
Religious Character,	.. Oochen, ..	.. Oochen, lunra,	.. Oochen, lunra.
Letter, ..	.. Oome, ..	.. Oome, ..	.. Oome.
Pots of all kinds,	.. Baring, ..	.. Nooshet, nooshut,	.. Baring.
Cooking Pot, ..	.. Butloee, ..	.. Dig. ..	.. Butloee.
China Saucer, ..	.. Derma, ..	.. Derma, ..	.. Derma.

ENGLISH.	MILHAN.	B,NOTEEA OR TARTAR.	T,HEENUSKUD.
China Cup, ..	.. Kareeul, ..	.. Kareeul, ..	.. Kareeul.
Earthen Pot, ..	.. K,hoang, gur, ..	.. K,hangse, t,hoaa, ..	.. T,hoaa, k,hoang, lotung.
Wooden Vessel, large, ..	.. Zum, ..	.. Zum, darozo, soomjok, ..	.. Zum, zom.
Wooden Vessel with spout, ..	.. Joaa, ..	.. Soa, ..	.. Zoa,
Brass Pot, large, ..	.. Lotree, ..	.. Digchoong, loogoo, ..	.. Lotree,
Ditto Plate, ..	.. Nang, ..	.. Derma, ..	.. Nung.
Small brass Pot, ..	.. Bat, ..	.. Prat, ..	.. Prat.
Wooden Plate, for knead- ing flour, ..	.. Koonalee, ..	.. ..	.. Koonalee.
Camp Basket, ..	.. Pit,har, ..	.. Zima, ..	.. T,habdom.
Teapot, ..	.. Tibril, ..	.. Batib, ..	.. Tibril.
Teaspoon, ..	.. Chidoom, ..	.. Chidoom, ..	..
Spoon, ..	.. K,heoch, ..	.. Chakcho, t,hoorma, ..	.. K,heot.
Iron for baking Bread, ..	.. Pan, ronpun, ..	.. Pan, ..	.. Rompun.
Iron Tripod, for Pot, ..	.. Lodanung, ..	.. Cheegeat, ..	.. Lodanung.
Wooden Vessel, small, ..	.. P,horwa, ..	.. P,horwa, ..	.. P,horwa, prot.
Benares, ..	.. Kasee, ..	.. Ooranasee, ..	.. Ooranasee.
Jugurnath, ..	.. Chamchookdoong, ..	.. Chamchookdoong, ..	.. Chamchookdoong.
Gya, ..	.. Durjeedin, ..	.. Durjeedin ..	.. Durjeedin.
The Ganges, ..	.. Chooma-gunga, ..	.. Choomo-gunga, ..	.. Choomo-gunga.
Mine, ..	.. K,haning, ..	.. Koomchang, ..	.. K,haning.
Ore, ..	.. Daeueung. ..	.. ..	..
Gold, ..	.. Zung, ..	.. Ser, ..	.. Zung.
Silver, ..	.. Mil, mool, ..	.. Mool, ..	.. Mool.
Iron, ..	.. Rung, run, pron, ..	.. Chakhs, chukh, ..	.. Chakh.
Copper, ..	.. Tramung, ..	.. Sang, zango, ..	.. Trumung.
Tin, Pewter, ..	.. Sot, ..	.. Sankurbuso, ..	.. Sot.

ENGLISH.	MILCHAN.	B, БОТЧА OR TARTAR.	T, ТЭБУСКУД.
Brass, ..	Peetul, ..	Raghan, ..	Peetul. ..
Mercury, ..	Mulchoo, ..	Mulchoo, ..	Mulchoo. ..
Lead, ..	Seek, ..	Shanee, riltee, ..	Seek. ..
Borax, ..	Ch,hale, ..	Ch,hale, ..	Ch,hale. ..
Gun, large, ..	Ramchung, top, ..	Toorka, ..	Top. ..
Ditto, small, ..	Topuk, ..	Toorka, ..	Topuk. ..
Matchlock, ..	Nal, ..	Doobuk, tooba, ..	Nal. ..
Bayonet, Spear, ..	Burcha, ..	Doong, ..	Burcha. ..
Shield, ..	Dal, ..	P,hoop, ..	D,hal. ..
Sabre, ..	Trooal, ..	Raldee, barung, ..	Trooal. ..
Scabbard, ..	Shoob, ..	Shoop, ..	Shoop. ..
Leaden Ball, ..	Galung, ..	Reeldee, ..	Galung. ..
Bow, crooked, ..	Goom, kuman, ..	Zhoo, ..	Goom, kuman. ..
Ditto, straight, ..	..	..	Yooee. ..
Arrow, ..	Mo ..	T,ha, da, ..	Sheem. ..
Gunpowder, ..	Daroo, ..	Za, man, ..	Daroo. ..
Knife, ..	Koor, koorch, k,hoorch, ..	Tee, ..	K,hoor. ..
Axe, for killing animals, ..	Goonaso, ..	Limba, ..	Goonasoo. ..
Ditto, for cutting wood, ..	Lashta, ..	Turee, taree, ..	Lakt,ha. ..
Penknife, ..	Dangra, tubur, ..	Neoogdee, ..	Neoogdee. ..
Razor, ..	Bankeech, ..	T,haguree, ..	Shagree, k,hoorung. ..
Needle, ..	K,hoorunts, ..	T,hak,hub, k,hab, ..	Kep. ..
Iron Chain, ..	Kep, ..	Chaktak, ..	Sunglung. ..
Steel, for striking fire, ..	Sumlung, suglung, ..	Mepcha, mekcha, ..	Mepcha. ..
Bell, ..	Ronk,ho, ..	Dheeloo, ..	Gantung. ..
Key, ..	Gangt,hung, ..	Koolig, d,heming, ..	Deemee. ..
	Talang, ..		



ENGLISH.	MILCHAN.	В,НОТЕНА ОН ТАТАР.	T,HEBURSKUD.
Padlock, ..	Shanung, ..	Koolchakh, golcha, ..	Zhona. ..
Hoe, ..	Zam, ..	.. ..	.. ..
Plough, ..	Stul, hulung, ..	T,hong, ..	Halas. ..
Yoke of Plough, ..	Shkol, ..	Neasing, ..	Pol. ..
Chisel, ..	Neano, ..	Zong, ..	Zong. ..
Pair of Tongs, ..	Cheemtoo, ..	Krampa, ..	Krampa. ..
Ditto of Scissors, ..	Katoo, ..	Katikpa, chemzhe, ..	Zhabre, chinba. ..
Saw, ..	Retur, ..	Sogle, ..	Retur. ..
Mallet, ..	Sdo, ..	Do, ..	Do. ..
Drill, ..	Burm, ..	Burm, ..	Burm. ..
Adze, ..	Basing, ..	Tebo, ..	Keoot. ..
Large Hammer, ..	Gonto, ..	T,hoa, ..	T,hoa. ..
Small ditto, ..	T,horo, ..	Lakt,ho, ..	T,horo, t,hochoong. ..
Anvil, ..	Gonung, ..	.. ..	.. ..
File, ..	Sekdur, ..	Sekdur, ..	Sekdur, ..
Borer, ..	Meeoong, ..	Mleeoong, ..	Meeoong, ..
Blowpipe, ..	P,hookree, ..	.. ..	P,hookree, ..
Iron Crow, ..	Mokung, ..	Chakber, ..	Mokung, ..
Ditto Wedge, ..	Chenung, ..	.. ..	Mat, ..
Ditto Nail, ..	Keelung, ..	Zer, ..	Keelung, ..
Pinchers, ..	Soneshung, ..	.. ..	Shoneshung, ..
Pricker, ..	Shulung, ..	Shulung, ..	Shulung, ..
Nippers, ..	Chups, ..	.. ..	.. ..
Bellows, ..	Sak,hool, ..	Boota, bootpa, ..	Bhootpa, ..
Pickaxe, ..	Goling, ..	Tokche, ..	Khoat, ..
Small Drum, ..	Dulkeech, ..	.. ..	Dulkee, ..
Large Trumpet, ..	Kunal, ..	Poa, ..	Kunal, ..

ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEHURSKUD.
Small Trumpet,	Shonal,	Hurib,	Shonal,
Fiddle,	Dutaro,	Gobo, peang,	Peang, gobo, dutaree,
Kettledrum,	Dhol,	Gna,	Dol,
Tambourine,	Ningaro,	Damun,	Domak,
Fife,	Basung,	Neoo, leon, leengo,	Basung,
Sea Conch,	Doong,	Doong, toong,	Doong,
1	Eet,	Cheek,	Tee.
2	Neesh,	Nee,	Neeshee.
3	Soom,	Soom,	Soom.
4	Poo, pook,	Zhee,	Pee.
5	Gna, ma,	Gna,	Gnaee.
6	Took, toog,	Took,	Tookee.
7	Steesh,	Doon,	Nushee.
8	Raee,	Geat, gea, ge,	Geaee.
9	Sgoee,	Goo,	Gooee.
10	Saee,	Choo-t, hamba,	Chooee.
11	Seehud,	Chooksheek, chookshee,	Chootee.
12	Soneesh,	Choonnee,	Choonee.
13	Sorum,	Chooksoom,	Chooksoom.
14	Supoo, supookh,	Choozbzee,	Chupee.
15	Suma, songa, sunga,	Choonga, chyinga,	Choang.
16	Surk, sorok, sotok,	Chootook, choorook,	Chooroo.
17	Suteesh,	Choobdeon, choobdoon,	Choobdoon.
18	Surhaee,	Chubgead, chubge,	Chubgead.
19	Susgoee,	Choorgoo,	Choorgoo.
20	Neeza,	Neeshoo, -t, hamba,	Nisa, neeza.
21	Neena-eet,	Chaksheek, chakshee,	Neesa-tee, &c.

ENGLISH.	MILCHAN.	В, ПОТЕНА ОН ТАРТАН.	Т, НЕБУРСКУД.
22	..	Channee, ..	..
23	..	Chaksoom, ..	..
24	..	Chabzhee, ..	..
25	..	Changa, ..	..
26	..	Charok, chatok, ..	..
27	..	Chabdoon, ..	..
28	..	Chabgead, chabge, ..	..
29	..	Chargoo, ..	..
30	..	Soomchoo-t, hamba, ..	Deoneeza.
31	..	Soksheek, sokchee, ..	Deoneeza-tee, &c.
32	..	Sonnee, ..	..
33	..	Soksoom, ..	..
34	..	Sobzhee, ..	..
35	..	Songa, synga, ..	..
36	..	Sorok, sotok, ..	..
37	..	Sobdoon, ..	..
38	..	Sobgead, sobge, ..	..
39	..	Sorgoo, sorkoo, soorkoo, ..	..
40	..	Zheebchoo-t, hamba, ..	Neesh-neeza.
41	..	Shaksheek, shakshee, ..	..
42	..	Shannee, zhynee, ..	..
43	..	Shaksoom, zhyksoom, ..	..
44	..	Shabzhee, zhybzhee, &c. ..	..
45	..	Shunga, shanga, ..	..
46	..	Sharok, shetok, ..	..
47	..	Shabdoon, ..	..
48	..	Shabgead, shabge, ..	..

ENGLISH.	MILCHAN.	B, БОТБА OR TARTAR.	T, ТЭБВУСКУД.
49	..	.. Shargoo, sharkoo,	..
50	.. Dyneeza,	.. Gnabchoo-t, hamba,	.. Dyneeza.
51	..	.. Gnaksheek, gnakchee,	..
52	..	.. Gnannee, ..	..
53	..	.. Gnaksoom, ..	..
54	..	.. Gnabzhee, ..	..
55	..	.. Gnunga, ..	..
56	..	.. Gnarok, gnatok,	..
57	..	.. Gnabdoon, ..	..
58	..	.. Gnabgead, gnabge,	..
59	..	.. Gnargoo, gnarkoo,	..
60	.. Soom-neeza,	.. Tookchoo-t, hamba,	.. Soom-neeza.
61	..	.. Raksheek, rakchee,	..
62	..	.. Rannee, ..	..
63	..	.. Raksoom, ..	..
64	..	.. Rabzhee, ..	..
65	..	.. Ranga, ..	..
66	..	.. Rarok, ratook, ..	..
67	..	.. Rabdoon, ..	..
68	..	.. Rabgead, rabge,	..
69	..	.. Rargoo, rarkoo,	..
70	.. Sadeshum-neeza,	.. Doonchoo-t, hamba,	.. Soom-neeza-chooe.
71	..	.. Tonsheek, donchee,	..
72	..	.. Tonnee, donnee,	..
73	..	.. Tonsoom, donsoom, &c.	..
74	..	.. Tonzhee, ..	..
75	..	.. Tonga, ..	..

English.	Милчан.	В,НОТНА ОН ТАРТАН.	Т,НЕРУСКУД.
76	..	.. Tondook, ..	..
77	..	.. Tondoom, ..	..
78	..	.. Tongead, tonge, ..	..
79	..	.. Tongoo, ..	..
80	..	.. Poo-neeza, ..	.. Pinneeza.
81	..	.. Geatchoo, geazhoo-t,hamba, ..	..
82	..	.. Keasheek, geachee, ..	..
83	..	.. Keannee, geannee, &c. ..	..
84	..	.. Keaksoom, ..	..
85	..	.. Keabzhee, ..	..
86	..	.. Keanga, ..	..
87	..	.. Keorok, keatok, geto, ..	..
88	..	.. Keabdoon, ..	..
89	..	.. Keabgead, keabge, ..	..
90	..	.. Keargoo, ..	..
91	..	.. Pooneza-sae, ..	.. Pinneeza-chooe.
92	..	.. Goobchoo-t,hamba, ..	..
93	..	.. Koksheek, kokchee, ..	..
94	..	.. Konnee, ..	..
95	..	.. Koksoom, ..	..
96	..	.. Kobzhee, ..	..
97	..	.. Konga, ..	..
98	..	.. Korok, kotok, ..	..
99	..	.. Kobdoon, ..	..
100	..	.. Kobgead, kobge, ..	..
200	..	.. Korgoo, ..	..
300	..	.. Ra, ..	.. Gea.
	..	.. Nee-za, ..	.. Neeshee-gea,
	..	.. Soom-ra, ..	.. Soom-gea,

ENGLISH.	MILCHAN.	B, БОТЧА OR TARTAR.	'T, HEVURSKUD.
400,	Poo-ra,	Zheebgea,	Pee-gea.
1,000,	Huzar,	Tong,	Choo-gea.
100,000,	Lak,h,	T,hee,	Lak,h.
10,000,000,	Kuror,	Boom,	Kuror.
1st,		Tangbo, dajee, goma,	Doonchee.
2d,		Nip,ha, neeba,..	
3d,		Soomba,	
4th,		Zheeba,	
$\frac{1}{4}$ ,	Prebung,	Cheekcha,	Pure.
$\frac{1}{3}$ ,	Adung,	Phe,	K,hanung.
$\frac{1}{2}$ ,	Soompre, shoompre,	Soomcha,	Soompure.
1 $\frac{1}{4}$ ,	Deo,	Cheek-p,he,	Deo.
2 $\frac{1}{4}$ ,	Dy,	Neesh-p,he,	Dy.
Twofold,	Neesh-doon,	Neebak,	Neeshba.
Threefold,	Soom-doon,	Soombak,	Soomba.
Once,	Eet-karung,	Lalcheek, lalcheeg,	Teekarung.
Twice,	Neesh-karung,	Lannee,	Neeshkarung.
January,	Mahang,	Daba-chooneeba,	Mahang.
February,	P,hungnung,	Daba-d,hangba, tangbo,	P,hungnung.
March,	Chetrung,	Daba-neeba,	Chetrung.
April,	Bysagung,	Daba-soomba,	Bysagung.
May,	Zhestung,	Daba-zheeba,	Zhestung.
June,	Asharung,	Daba-maba, gnaba,	Asharung.
July,	Shamnung,	Daba-tookpa,	Shamnung.
August,	Badrung,	Daba-doonba,	Badrung.
September,	Indurmung,	Daba-keipa, keba,	Indurmung.
October,	Kateerung,	Daba-gooba,	Kateerung.

ENGLISH.	MILNEAN.	B, MOTERA OR TANTAN.	T, SEEDUSKUD.
November,	Mooskeerung, ..	Daba-chooba, ..	Mooskeerung.
December,	Poshang, ..	Daba-chookcheekpa,	Poshang.
Sunday,	Aetwarung, ..	Za-meema, ..	Aetwarung.
Monday,	Soarung, ..	Za-daba, ..	Soarung.
Tuesday,	Munglarung, ..	Za-meengmar,	Munglarung.
Wednesday,	Bood,harung, ..	Za-lakpa, ..	Bood,harung.
Thursday,	Brasput, ..	Za-p,hoorboo,	Brasput.
Friday,	..	Za-pasung, ..	Sookarung.
Saturday,	..	Za-penba, ..	Shunsheerus.
I,	munneerus, ..	Gna, ..	Gee, geo.
Thou,	Goo, gooa, neenga,	Keot, ogo, k,herung,	Hoonce, gnan, gna.
He,	Kee, ka, kas, ..	P,haee, te, k,hong,	Oodoomee, uroo, wa, p,ha.
We,	No, noa, zha, zho,	Gnatumshe, net, ..	Eneshe, eneatumg.
You,	Kishung, ..	Kharung tamah, k,hetgeak, ..	Gnaneeshe, oonpatung.
They,	Kee, keea, keena,	P, ..	Urteeshe.
This,	No, nogonda, zobugo,	Dee, d,hee, ..	Oea, aee, yooee.
That,	Yo, zha, ..	Ote, oode, p,hagee,	Oza, uroo, ado.
You all,	No, noo, ..	Keothuk, keotha, goon, ..	Goon.
We all,	..	Gnathuk, net, ..	..
Who,	Hatto, haee, ..	{ K,hoee, soola, soo, kangeeda,	Boonee, soo.
What,	T,he, hum, ..	{ socee, ..	K,hainde, go, k,ha, ka.
Mine,	Ung, ..	Chce, gang, ka, cha, ..	Gee.
Yours,	Kana, keena, ..	Gnarung, gnaringee, ..	Gnan, oonce.
His,	Zhoo, noo, ..	K,heourung, keoringee,keoke, Uroo.	Uroo.
Any body,	..	Te, no, ..	..
One's own,	..	Lering, ..	..
	..	K,hoee, ..	..

ENGLISH.	MILCHAN.	B, HOTEZA OR TARTAR.	T, HEBURSKUD.
Whatever,	..	.. Zhalma, shalma,	..
Another,	..	.. Zhancheek, ..	.. Drongtee.
How many,	..	.. Champeen, chumgee, chum,	.. Eneta, wanee, ene.
All you people,	..	.. K, heot-tamchat,	.. Hoonatung.
This side,	..	.. Choorka, ..	.. Deezhoor.
That side, across,	..	.. P, harka, ..	.. Doozhoor.
Near, beside,	..	.. Doroo, nemoo, ..	.. Nemo.
Beyond,	..	.. P, hagee, p, hala,	.. Dooroo.
Away,	..	.. ..	..
Without (wanting,)	..	.. Mitkun, ..	.. Manunee.
Again,	..	.. Pheemo-chookpa, dalda,	.. Neooa, tatla, logh, dulda.
Yes,	..	.. Ou, la, koosul, ..	.. Ou, oung, o.
No,	..	.. Me, met, ..	.. Manee.
Pleasantly,	..	.. Tanbo, ..	.. Tanno.
Whence,	..	.. Kana, ..	.. Gochee.
What like,	..	.. Cheenda, ..	.. K, hunea.
How often,	..	.. Cham, chamcha,	.. Enektia.
That place,	..	.. Tere, ..	..
From within,	..	.. Tangma, nangma,	.. Nongonche.
Above, Up,	..	.. Tang, nang, k, hatok,	.. T, harung, chokcho, chopcho,
Below, Down,	..	.. Yokh, yog, mala,	.. Yagoon, yoogoon, yoogin.
Afterwards, Backwards,	..	.. K, habrul, geatpo,	.. Geabchee.
Behind,	..	..	..
Before,	..	.. Koongtal, doondo,	.. Donchee.
Between,	..	.. Zhoong, ..	.. Keelo.
Enough,	..	.. Yong, mangbo,	.. Ho.
Here.	..	.. Deeroo, eeroo, ..	.. Oeea.



ENGLISH.	MILCHAN.	B.НOTEPA OR TAPTAР.	T.НEВУРСКУD.
There,	.. Noa, doa, ..	.. P,hagee, magee, ..	.. Doa, ona, oza.
Hence,	.. Zboouks, ..	.. Deena, gana, ..	.. Oeachee, aeeche.
How, How much,	.. Tera, te, teta, ..	.. Chum, chumcha, ..	.. Ene, enekta.
Now,	.. Hoon, hoona, ..	.. Ta, takhsung, ..	.. Lisungo.
Quickly,	.. Hal, hasil, hojoa, ..	.. Shok, jokhsa, geokpa, ..	.. Keokkhsa, geokpa.
When,	.. Terung, ..	.. Nam, name, ..	.. Eno, eenoo.
Slowly,	.. Mesung, ..	.. Kale, goloo, ..	.. Mesung.
Within,	.. Koomo, ..	.. Nangdoo, tangdoo, tangna, ..	.. Nangdoo, nowun.
Without,	.. Barung, ..	.. P,ha, p,heeta, ..	.. P,heetala, p,heelokh.
Where,	.. Hum, ..	.. Kangdoo, gana, ga, gan, kala, ..	.. Goa, go.
Very,	.. Dir, up,har, ..	.. Mangbo, ..	.. Bong.
Always,	.. Suda, ..	.. Tandoo, ..	.. Soda.
From,	.. Buksh, duka, na, no, che,o ..	.. So, na, soo, ..	.. Che, un, chee, soo.
With,	.. Dung, rung, ..	.. Laroo, ..	.. Dung.
In, into,	.. O, ..	.. Roo, la, doo, ..	.. Un, oon, goon, che.
On, upon,	.. En, o, den, oon, oom, ..	.. La, k,hatookba, le, ..	.. To, chapcho.
More,	.. Aee, ..	.. Diring, yang, ..	.. Duroong.
At another time,	.. Nepeks, ..	.. Zhanla, logh, dalda, ..	.. K,heenping, neka.
Also,	.. ..	.. Lang, ..	.. Lee.
Any where,	.. Kamee, hamee, ..	.. Ganeung, goeo, ..	.. Goeo.
Of,	.. O, ..	.. Ge, ..	.. Ge, ke.
To, For,	.. O, lo, ung, rung, pung, ..	.. La, roo, ..	.. O, do, to, goon, un, na.
Why,	.. Chera, phoo, ..	.. Cheela, cheephila, ..	.. K,hyro.
Or,	.. Kee, ..	.. ..	.. La.
White,	.. T,hog, ..	.. Karbo, ..	{ T,hungnee, chungnee. — { chang.
Black,	.. Reg, rok, ..	.. Nakpo, nangmo, ..	.. Kanee.

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ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEBURSKUD.
Red, Red hot, ..	Shooeeg, ..	Marbo, ..	Mangnee. ..
Green, ..	Rag, ..	Zhango, ..	Zhango. ..
Blue, ..	Rak, rok, ..	Monpo, ..	Teengnee. ..
Yellow, ..	Peek, peekla, ..	Surbo, ..	Lene. ..
Light-grey, ..	..	G, honpo, toosee, ..	..
Brown, ..	..	Keata, zheangnak, ..	Zheankoo. ..
Orange, ..	..	Chinka, chulkur, ..	..
Striped, ..	..	T, hata, t, hao, ..	Patlo. ..
Square, ..	Poozrak, ..	Doobzhee, ..	Peezoor. ..
Round, ..	Boorboor, ..	Riril, ..	Boorboor. ..
Oval, ..	Lamas, ..	Nurnur, ..	Chonchon. ..
4-sided, ..	Poozir, ..	Doobzhee, ..	Peezoor. ..
5-sided, ..	Gnazir, ..	Doongna, ..	Gnazoor. ..
Even, Plain, ..	Pudrus, sped, mushtus, ..	T, hangbo, dunda, ..	T, hanga, t, hanea. ..
Different, ..	Soso, hednee, ..	Soso, ..	K, hecho. ..
Same, ..	Eedee, ..	Neampo, ..	Neampo. ..
Clean, ..	Mahtus, t, hog, ..	Karbo, takpo, ..	Chungnee. ..
Dirty, ..	Kree, ..	Tema, ..	Kree. ..
Dark, ..	{ Aceearung, seenarus, ..	Moonteekh, ..	K, habung. ..
	{ tam-sang, ..	..	..
Light, ..	Zhudodoo, ..	T, hungpo, ..	Chunglung. ..
Dear, ..	Gotee, zatee, ..	Gonbo, ..	P, hampo. ..
Cheap, ..	Churus, bodee, ..	K, hemo, ..	K, he. ..
Dry, ..	Charch, chars, ..	Kampo, ..	P, horka. ..
Wet, ..	Teesre, speeng, speesh, ..	Lonpa, ..	Cheeko. ..
Distant, ..	Warik, dur, ..	Ringbo, t, hagrang, ..	Warkor, war, warko. ..
Near, ..	Nerung, ..	Nemo, ..	Nemo. ..

English.	Milchan.	B, KOTHA OR TARTAR.	T, HEBURKUD.
Fresh,	.. Kanung, ..	.. Nurgamo, ..	.. Ma-soashea.
Rotten,	.. Sanung, soasho,	.. Nurmet, ..	.. Soashea.
Fat,	.. Motus, ..	.. Bompo, rompo,	.. Burka.
Lean,	.. Nakeech, ..	.. T,hamo, ..	.. Nakeet.
Fine,	.. Lanus, paech, ..	.. T,hamo, tapo, ..	.. Nakeet.
Coarse,	.. Motus, ..	.. Rombo, ..	.. Burka.
Good, Well,	.. Dam, dambash,	.. { Gamo, poochung, etpo, kamo, jakpo, .. }	.. Ebuta, epo.
Large,	.. Tek, teg, ..	.. Chinmo, chitpo, chidmo,	.. Shangnee.
Small,	.. Gato, zaich, zigich,	.. Choogoon, ..	.. Tsigee, keta, zigit.
Large and Small,	..	.. Chuchoong, ..	..
High,	.. T,hoa, ..	.. T,hampo, ..	.. T,hampo.
Low,	.. Yooa, ..	.. Mamo, ..	.. Mamo.
Finished,	.. Doogeo, ..	.. Yongsoong, ..	.. Wangzoo.
Heavy,	.. Leehig, ..	.. Cheende, ..	.. Leeko.
Light,	.. Langeets, ..	.. Yangmo, ..	.. Yanko.
Hard,	.. Talk, ..	.. Geongbo, ..	.. Geongbo.
Soft,	.. Kolus, ..	.. Boolbo, ..	.. Boolbo.
Hot,	.. Zhang, zhabung,	.. Donmo, ..	.. Kosra.
Cold,	.. Lisk, leesk, ..	.. Tangmo, ..	.. K,hutkeo.
Much, many,	.. Churus, teong, up,har,	.. Sambo, mangbo,	.. Bong.
Few,	.. Cherib, ..	.. Choogoon, ..	.. Zigit,
Narrow,	.. Zatee, ..	.. Zhenchoogoon,	.. Zhenchoong.
Broad, wide,	.. Churus, koonk,	.. Zhenchinmo, ..	.. Zheengchun.
New,	.. Neoong, ..	.. Soma, ..	.. Neoongnee.
Old,	.. Ooshk, roozha, ..	.. Neengpa, ..	.. Neengpa.
Naked,	.. Salgee ..	.. Chergong, ..	.. Suptee.

ENGLISH.	MILCHAN.	B, HOTEPA OR TARTAR.	T, HEBURSKUD.
Well, Whole, ..	.. Sarus,	.. Changbo,	.. Sarus.
Sick, ..	.. { Sursheemurko, truch, toto, ..	.. Nazha,	.. Nabung.
Right, ..	.. Zugung,	.. Yatal,	.. Doore.
Left, ..	.. Derung,	.. Yoontal,	.. Bae.
Deaf and Dumb,	.. Lata, zharo,	.. Kol,	.. Lata, kol.
Weak, ..	.. Murdar,	.. Romyookung,	.. Lonatpa.
Strong, ..	.. Moostund,	.. Shakageakhpa,	.. Moostundo.
Perpendicular, Plain, Strait,	.. Pudrus,	.. T, hungpo,	.. T, hunea.
Slanting, ..	.. K, her,	.. Yonte,	.. K, her.
Uneven, ..	.. Yooa-t, hoa,	.. Gen-t, hoor,	.. Tang-t, hoor.
Crooked, ..	.. { K, hoongsheem, koota, kootang, ..	.. Goorgoor,	.. Goorgoor.
Blind, ..	.. Kanung,	.. Zhura,	.. Kano.
Lame, ..	.. K, horus, k, horung,	.. Zhao,	.. Khorus.
Lazy, ..	.. T, hisk,	.. Lelo,	.. Ulseekh.
Clever, ..	.. Dambash,	.. Gamo,	.. Epobash.
Some, ..	.. Cheta,	.. Cheeachee,	.. K, hulukha.
Deep, ..	.. Doogus,	.. Syting, chokheeldoo,	.. Doogus.
Written, ..	.. Tateek,	.. Teechur, deeeeut,	.. Chegunee.
Right, ..	.. Boongee,	.. Teek,	.. Tan.
Full, ..	.. Shae, shagee,	.. Kangchur, k, hang,	.. Bingzo, bing.
Empty, ..	.. Sochus,	.. Toongba,	.. Toongpa, tongpa.
True, ..	.. Zeetus,	.. Dinba,	.. Deemlo.
Rich, ..	.. Daljees,	.. Nurduk,	.. Chookpo.
Poor, ..	.. Shooeo, loongeo,	.. Meltokh,	.. Metpo.
Ripe, ..		.. Choghain, choa,	.. Shobung, sho.

ENGLISH.	MILCHAN.	B, HOTEHA OR TARTAN.	T, HESBUESKUD.
Unripe,	.. Mashos, mashoeo, cheeshpoeo,	Meechoghain. ..	.. Kachung, masho.
Young,	.. Dekrus, dikrach, neook,	.. Shura, soma, ..	.. Shura.
Beautiful,	.. Dam, ..	.. Lakpo, ..	.. Zoko.
Ugly,	.. Maree, kochung,	.. Chookpo, t,hoo,	.. Mazoko.
Bad, Wicked, ..	.. Mur, köchung,	{ T,hamu, lodpa, dibchun, aghe, ganba, chookpo,..	Kochungta.
Sour,	.. Soork,	.. Keormo, ..	.. Soorko.
Sweet,	.. T,heek, im,	.. Zimba, shimbo, gnarmo,	.. Neamko.
Bitter,	.. Kahuk,	.. Shantee, k,hakpo,	.. K,huktukpa.
Silent,	.. Tam,	.. Tame, ..	.. Tamna.
Slack,	.. T,hisk,	.. Yangpo, ..	.. Moktus.
Tight,	.. Chal,	.. Tokpo, ..	.. Gutus.
All,	.. Choe, she,	.. Top, t,hamche, t,hamchat,..	U,ung, shet.
Angry,	.. Roahung,	.. T,hoogro, ..	.. Cheekpa.
Blunt,	.. Mootlo,	.. Me-nunpo, ..	.. Me-chunko.
Sharp,	.. Rask,	.. Nunpo, nunpo,	.. Chunko.
Broken,	.. Zhookeo,	.. Chukchur, ..	.. Keakcha, keaka.
Running (Water,)	.. Beho,	.. Loonga, ..	..
Cloudy,	.. T,hinga,	.. T,hinga, ..	.. Dinga.
To Ask, Beg, ..	.. Oonming, eemig,	.. Rezha, dheaja, ribja,	{ T,habung, t,hoabung, shao- pung.
„ Arrive, ..	.. Poonmig, pooshmig,	.. Gerzha, langzha, lebzha,	.. Nookpung, nootpung.
„ Assemble, ..	.. Doonmig,	.. Chungma-dozha,	.. Autung-zapung.
„ Ascend, ..	.. Tangmig,	.. Gen-lerja, ..	.. Tungmung.
„ Allow, ..	..	.. Chookcha, ..	.. Matpung.
„ Be, ..	..	.. Yozha, ..	..
„ Buy, ..	.. Zongmig,	.. Neozha, ..	.. Chongbung.

ENGLISH.	MILCHAN.	В, ПОТЕНА OR TARTAR.	Т, НЕВЕРСКУД.
To Burn, <i>v. a.</i>	Pongmig, bongmig, beenmig,	Tookzha, takzha,	.. Rotbung, beekpung.
" Blow, ..	P, hongamig, p, hokramig, ..	P, hoozha, ..	.. P, hoobung, p, hoosootpung.
" Beat (a Drum,)	Tongmig, bujamig, ..	Doonja, d, hoonja, tokja,	.. Koolbung, bujabung.
" Build, ..	Pangmig, langshemig, ..	Chozha, cheekzha,	.. Lenmung.
" Bring, ..	Leamig, kermig impkera, ..	Khoorzha, k, hebzha,	.. Repung imp. Bret. rikpung.
" Bore, ..	Kamig, ..	Pookcha, ..	.. P, heokpung.
" Break, ..	Choongmig, tookmig, toonmig	Chokcha, choomzha, chakja,	Keakpung, imp. kea.
" Boil, ..	Skooanig, ..	Kolzha, ..	Kooatpung.
" Blow, ..	P, hooeamig, ..	P, hoozha, ..	.. (B. imp. Raee.)
" Bring, ..	{ Kammig, karmig, leshis- mig, kashkemig, .. }		
" Bury, ..	K, harung, kormig, ..	Sana-lokcha, ..	Matungchee-hanmung.
" Bite, Sting,	Burangmig, cheengmig, ..	Mookcha, ..	.. Cheepung.
" Bray, Neigh,	Bushushmig, ..	Kacha, ..	.. Busutpung.
" Bark,	Choolmig, chool-tongmig, ..	Kacha, ..	.. Zoolbung, busutpung.
" Blow the Nose,	Seetung, -yoongmig, ..	Nachoo-peeja, ..	.. Seebung-serbung.
" Count, ..	Narmig, ..	Cheezha, ..	.. Shoommung.
" Cook, ..	Lunnig, ..	Chozha, ..	.. Lenmung.
" Call, ..	Koonig, imp. koon, koot, ..	Bocha, imp. bot, kucha,	.. Hotpung. imp. hot.
" Cohabit, ..	Goahmig, gonmig, ..	Geoja, imp. go, ..	.. Goolbung.
" Cough, ..	Choomig, ..	Ook t, hookcha, ..	.. Depung, imp. det.
" Carry, Carry off,	P, heemig, keramig, ..	Kerzha, k, herzha,	.. Kamchee, lopung.
" Converse, ..	Batung, lonmig, ..	Kucha-lupcha, ..	..
" Crawl, ..	Syooma-yoonmig, ..	T, honja, ..	Wungpung.
" Come out, ..	Doonmig, ..	Chacha, chakcha, ..	Wokpung.
" Cut, ..	Mulmig, ..	Shokja, yongzha, keocha, ..	Rabung, imp. raee.
" Come, ..	Boonmig, zhamig, zheeramig, ..	Lebzha, p, hepja, ..	..

ENGLISH.	MILCHAN.	B, HOTEHA OR TARTAR.	T, HEBURKUD.
To Dwell,	.. Busunig, neemig,	.. Chaksha.	.. Busutpung.
" Die,	.. Sheemig,	.. Sheezha,	.. Sheechbung.
" Do,	.. Lanmig,	{ Pecha, geazha, chozha, checha, bezha.	{ Lemung, imp. len.
" Drown,	.. Doobeamig,	.. Doorzha,	.. Doobeatpung.
" Dive,	.. Teeo-beemig,	..	..
" Drink,	.. Toongmig,	.. T,hoongja,	.. Toongmung,
" Descend,	.. Yooa-beemig,	.. Deeroo-shokzha,	.. Deeroo-rabung.
" Dance,	.. Chamig,	.. Soonzha, chezha,	Shonmung, garbung.
" Dig,	.. Kormig,	.. Kokcha, kocha, doozha,	{ Korbung, kotebung, imp. kotae.
" Divide,	.. Kangmig, achemig,	..	..
" Dream,	.. Mangmig,	.. Meengzha,	.. Mangmung.
" Dry,	.. Charmig,	.. Kamzha,	.. P,hopung.
" Eat,	.. Zamig,	.. Saja,	.. Zabung, imp. zae, za.
" Fight,	.. Rashmig, dashmig,	.. Zingre-peechea, nolja,	.. Bilsheebung, koolsheebung.
" Find,	.. Puremig, puramig,	.. T,hopcha,	.. Purutbung.
" Fall,	.. Gormig, brook-beemig,	.. Deelja, p,herja, dimzha,	.. Keshbung, kekshbung.
" Forget,	.. Bushmig, bushemig,	.. Jutch,	.. Reebung.
" Fear,	.. Beangmig,	.. Zheekcha,	.. Lotpung.
" Fire (a Gun,)	.. Pyamig,	.. Geopcha,	.. Gearbung.
" Fill,	.. Poongmig, boongmig,	.. K,bongzha, k,hangzha,	.. Tatpung.
" Flow,	.. Bongmig, bohémig,	.. Dozha, geookcha,	.. Peenpung.
" Give,	.. Ranmig, kemig, imp. ken,	{ Tocha, tacha, terzha, karzha, tongzha, t,hocha,	.. Boetpung.
" Get drunk,	.. Keosmig,	.. Rarozha,	Dabung, k,hebung. imp. daee. .. Yeopung.

ENGLISH.	MILCHAM.	B. ПОТЕНА OR TARTAR.	T. HEBURSKUD.
To Get up, ..	Surahmig, ..	Longzha, ..	Shotpung.
" Gather, ..	T, homig, ..	Dookcha, ..	T, hootpung.
" Groan, ..	Choonemig, ..	Khooncha, ..	..
" Grind, (beat,) ..	Yoonming, ..	T, hokhja, takzha, ..	tokpung.
" Gape, ..	Khakangkamig, ..	K, hapeja, ..	..
" Go, ..	Heemig, imp. bae, ..	Dozha, songzha, ringzha, ..	Debung.
" Hunger, ..	Beenmig, ..	P, hooja, ..	..
" Hack, ..	Onmig, ..	Tokzha, ..	Krebung.
" Hear, ..	Chomig, ..	..	..
" Hang, (a thief,) ..	T, hasmig, rochmig, ..	Choraha, neanja, ..	Roongpung, gopung.
" Invert, ..	P, haecohmig, ..	Chang chang choopcha, ..	P, hansee-dabung.
" Jump, ..	Gomlanig, ..	Khabook-checha, ..	Gom-lembung.
" Knock, ..	Goamig, langhemig, ..	P, hakcha, ..	Goangpung.
" Kill or Beat, ..	Tok, hamig, ..	Doongaha, ..	Koolbung.
" Keep, ..	Sandmig, sanmig, imp. sat, ..	Socha, Sacha, ..	Satpung.
" Kick, ..	Tamig, ..	Borzha, ..	Tabung.
" Know, Understood, ..	Spugua-ranmig, ..	T, heo-geabcha, ..	Pukchoo-tapung.
" Knead, ..	Nemig, gomig, ..	Shesha, ..	Sepung.
" Lick, ..	Stemig, ..	Zeezha, ..	Moochamung Imp. moocheet.
" Lie down, ..	Lemming, ..	Dakcha, ..	Lembung.
" Learn, ..	Kherdishmig, ..	T, betdacha, ..	Preipopung Kherpopung.
" Let go, ..	Koosheemig, ..	Lapcha, ..	Lupaheebung.
" Laugh, ..	Charamig, ..	Keorja, churja, tonzha, ..	Plootpung.
" Live, ..	Wannig, ..	Gocha, ..	Wotpung. Kangsheebung.
" Light, (a fire,) ..	Shoongmig, ..	Songzha, ..	Seengbung.
" Look, ..	Parmig, ..	Barzha, Tangzha, ..	Choitpung.
	Damig, ..	Chalaha, ..	P, hatpung, t, hangmung.



ENGLISH.	MILCHMAN.	B, MOTERA OR TARTAR.	T, HESUNERUD.
To Load, (a gun.)	Poongmig, ..	Kangzha, ..	Peenmung.
" Milk, ..	Choormig, ..	Zhozha, ..	Choorbung.
" Melt, ..	Gulamig, guladmig.	Zhoozha, ..	Golatpung
" Mend, ..	Tooninakeo-lanmig toonamig,	Toor-geapcha, ..	Tootabung.
" Make, do, ..	Lanmig, ..	Zozha, lynzha, ..	Lemung, imp. len.
" Mix, ..	Skormig, shkonmig,	Tezha, Tookhja,	Koobung, thoeabung.
" Measure, ..	Reennig, ..	Reenzha, ..	K, hooroo-p, heakpung.
" Nourish, ..	Yongmig, palamig,	Talzha, ..	Keotpung.
" Open, ..	Tongmig, toangmig,	Pootzha. peja, ..	P, hebung, pebung.
" Obey, ..	Muneamig, ..	Cheezha, ..	Munabung.
" Plant, ..	Rameamig, ..	Chookcha, ..	Romeabung.
" Place, imp. shet,	Shenmig, taomig, thomig,	Porzha, jupeha,	Tabung, chakpung.
" Plough, ..	Hulung-lanig,	Zheeng-mozha,	Hulus-lenmung meobung.
" Press, ..	Changmig, ..	Chakcha, ..	Chakchakpung.
" Petition, ..	Urz-lanmig, ..	Zhooa-p, hoolzha,	Urz-lenmung.
" Play, ..	Yochmig, ..	Cheja, ..	Geabung.
" Pound, ..	Koolmig, ..	Doongzha, ..	Koolbung.
" Push, ..	Yoonig, ..	P, hoolja, ..	Nookpung.
" Print, ..	..	Par-geabcha, ..	Par-totnuna.
" Pull, ..	..	ap. dap. T, hingzha, t, benzha,	dap.
" Prick, ..	..	Chookcha, sookcha,	..
" Put on (clothes,)	..	Goenje, imp. gon,	{ P, hoocheebung, imp. p, hoo cheen.
" Root out, ..	..	Jubcha, p, hocha, pokhja,	P, hoonmung.
" Remove, ..	Seamig, ..	..	..
" Ring (a bell,)	Bajamig, ..	Doomja, doongzha,	Bojabung, imp. bujaee.
" Read, ..	Purusmig, ..	Dokcha, ..	Seelbung.

ENGLISH.	MILCHAN.	B, HOTEZA OR TARTAR.	T, HEEBESKUD.
To Run,	.. D, hyamig, t, hooremig,	Geokcha,	Galbung, gralbung, boetpung.
" Ride,	... Deshokahimig, Shokshemig,	Zhonzha, shonzha, zonzha,	Shooksoobung.
" Roast,	.. Poksheemig,	Shakcha,	Rotpung.
" Roll up,	.. Meteumig,	Tilja,	Meteabung.
" Reap,	.. Cholanig,	Gnazha,	K, hobung.
" Run away,	.. Bohmig,	Shorzha,	Bropung.
" Rain,	.. Budomig, lugdomig,	Yoanzha,	Ruga, bung.
" Stab,	.. Gosh-ranmig,	Choozha,	Chootpung.
" Slip,	.. Brench-Eemig, blenmig,	Decha,	Bletpung.
" Stoop,	.. Rong-beemig,	..	..
" Sing,	.. lanmig,	Tonzha, lenja, tongzha,	K, herbung.
" Sit, stay,	.. mp. toakeen,	Docha, zokbzha, zokhja,	Popung.
" Sell,	.. t, ren,	..	..
" Speak,	.. ig, tachmig,	..	..
" Search,	.. eheemig,	..	..
" Stride,	..	..	..
" Swim,	..	..	..
" Stand up,	..	..	..
" Snatch, sure,	.. Choommig, asarchoomig,	Kagzha, langzha,	Shotpung.
" Shave,	.. Chongmig,	Zoomja,	Choommung.
" Silence,	.. Tamtoshmig,	Chacha,	Gnokpung.
" Smell,	.. Stamig,	Tame-docha,	..
" Spit,	.. T, hoo bung-choarmig,	Noomzha,	Moonmung.
" Shut,	.. Peenmig, imp. peet,	Chemzha, lootpa-thookcha,	Latec-p, henpung.
" Sleep,	.. Yangmig,	Chookcha, Geapcha, joopja,	Peekpung, imp. pee.
" <del>Stalk,</del>	.. <del>K, beemig, wagmig,</del>	Nealzha,	Gochbung,
		Tosha, teja; thoogzha, thooja,	Kanmung, tungmung.

ENGLISH.	MILCHAN.	B, HOTESA OR TAKTAR.	T, HESUMAKUD.
To Steal,	Choramung-damig	Koozha, ..	Khootpung,
" Shew,	K, heemig, ..	Tanja, ..	Kangmung,
" Split,	{ P, holmig, .. { Parmig, p, hangmig,	Chacha, shakbsha,	P, holbung.
" Sew,	Ponmig, chemmig,	Chimzha, ..	Poonmung, ponmung.
" Spread,	Pooshthenig, planig,	Teengne-tongzha,	T, heenga-dabung.
" Sow,	Pooshmig, ..	Tapja, ..	Peetpung.
" Serve,	Dang-lanig, ..	Soorja, sorokcha,	Ringbung.
" Say,	Ringmig ..	Tontongzha, ..	K, herbung, k, helbung,
" Turn out,	Teeksaarmig, ..	Komzha, ..	..
" Thirst,	Chermig, cheerumig,	Chotzha, chacha,	..
" Tear,	Chourmig, ..	Dimzha, Dimtungzha,	..
" Throw,	Choonmig, ..	Tomja, domja, keekcha,	..
" Tie,	T, hoornig, tolamig,	Kobzha, takcha, toghzha,	..
" Take up,	Lismig, ..	Darzha, ..	..
" Tremble,	Booshmig, ..	Dimzha, ..	..
" Twist,	..	Koora-koozha,	..
" Take a walk,	Yanig, ..	Lenja, noenja, kherja,	imp.
" Take,	Dunnig, ..	Boraha, ..	..
" Tumble,	Toanmig, ..	Tonzha, ..	..
" Take out,	Teekeamig, ..	Chanee-geopcha,	..
" Take aim,	P, beemig, ..	Neozha, yazha,	..
" Take,	Thormig, ..	Tolzha, ..	..
" Unloose,	Yoonmig, beemig,	Dozha, ..	..
" Walk,	Nelote-lonmig,	Dozook-serja, ..	..
" Whisper,	..	..	..

ENGLISH.	MILCHAN.	B, HOTEPA OR TARTAR.	T, HEBURSKUD.
To Weave,	.. Tungmig,	.. T, hakcha,	.. Takpung.
„ Wash,	.. Cheemig,	.. Tooza, t, hooja, shalja,	.. Oorbung.
„ Weep,	.. Krammig,	.. Goonja, gnoozha,	.. Toebung.
„ Write,	.. Chemig,	.. Teezha,	.. Chebung.
„ Whistle,	.. Shooshooling-lanmig,	.. Shooshoo-serja,	.. Shooshee-lepung.
„ Weigh,	.. Tolamig,	.. Korzha,	.. Tolabung.
„ Wake,	.. Tosheemig, sarmig,	.. Goolja,	.. Tekpung.
„ Wish,	.. Geamig,	.. Goezha,	.. Geoonmung.
„ Warm,	.. Parshmig,	.. Dezha,	.. Toshbung.
„ Yawn,	.. Hushkamshmig,	.. Hahaezha,	.. Hushkamung.
„ Yoke, (in a plough,)	.. Tocheamig,	..	..
Am,	.. Took,	.. Yook,	..
Is,	.. To, doon, doo,	.. Yot, hin, dook,	.. Nee, Sa, hin.
Are,	.. Ton,	.. Yoze, yoen, yot,	..

Hold your tongue,	1 2 silent remain Tame dot,	1 2 Tame dot,	1 2 Tanna po.
	1 2 how many years have gone to you	5 4 2 1 3	5 4 1 2 3
How old are you,	1 2 Te bursung beeo ka lo,	1 2 3 4 Keotla lo cham song,	1 2 Gnano ene bursung de.
To-day it is cloudy,	1 clouds 2 Toro zhoo to,	1 2 3 4 to day sky cloudy is	1 2 3 4 Diring num dinga ta.
In the hand,	1 2 3 God o,	2 1 2 1 Diring num t,hinga yut,	2 1 La goon.
Go with him,	1 2 3 Noo dung beeo,	3 2 1 Luktoo, lakpa la,	3 2 in company 1 Uroo dung yambo de.
Oh man,	1 2 Dam to, dambasheton,	2 1 2 1 Gamo yot, jakpo yoze,	2 1 Epo nee.
Are you well, . .	1 2 Me beetkeo,	1 2 Me sheeo,	1 2 Me beekcha.
In the arms (embrace,)	1 2 Noa hatto,	1 3 2 Soo hin,	1 3 2 Soo nee.
The fire has gone out,	1 2 3 Molung t,he to,	1 3 2 Chee reeng yut,	1 3 2 Kha molunge nee.
Who is there,	1 2 Zheera,	1 1 2 P,bep,h,	1 2 Runa.
What is the price,	1 2 Hum to,	3 how much 2 Kangdoo, ganayot.	3 Go nee.
Come,	1 2 Kantee keebrung,	2 Reen chum him,	3 Ene molung.
Where is it,	1 2 Kantee keebrung,	2 Reen chum him,	3 Ene molung.
What is the price,	1 2 Kantee keebrung,	2 Reen chum him,	3 Ene molung.
Very early,	1 2 Kantee keebrung,	2 Reen chum him,	3 Ene molung.

ENGLISH.	MILCHAN.	B, HOTEKA OR TARTAR.	T, HEBURSKUD.
Turn him out,	.. To toa shet, .. <sup>1 1 2</sup>	.. Tontong, .. <sup>1 1 2</sup>	.. P, hana k, her, p, hanak, hel.
How many times have I told you,	.. Tenjubur, te-lok, .. <sup>1 1 2</sup>	.. Chamcha, -cham, -lupsong, .. <sup>1 1 2</sup>	.. Enehta lokee.
Silence,	.. ..	{ K, hatoo toong, k, harokpa dot, zal toksho, ..	..
Stop,	.. D, hen tosh, .. <sup>1 2 1</sup>	.. ..	..
Come down,	.. Shoong zha, shoong zheera, .. <sup>1 2 1</sup>	.. Mala shok, .. <sup>2 1</sup>	.. Yat raee. <sup>2 1</sup>
Go up,	.. Ring beo, .. <sup>1 2 1</sup>	.. Yala song, .. <sup>2 1</sup>	.. Lo de. <sup>2 1</sup>
Come here,	.. Lo zha, .. <sup>1 2 1</sup>	.. Deeroo shok, .. <sup>2 1</sup>	.. Oea raee.
Go along,	.. Nes beo, paenj beeto, ..	.. Phula song, ..	.. Boet kade, duroo de.
Take care,	.. T, hulun ral, .. <sup>1 2 1 3 3</sup>	.. Ta cheek, tanesong cheek, .. <sup>2 1 3</sup>	.. Kan chee. <sup>2 1 3</sup>
Where are you going,	.. Ku hum-beetun-betish, .. <sup>1 2 3 4 1 2 2</sup>	.. K, herung gana-songzha, .. <sup>3 4 1</sup>	.. Gnan go-deno- debung. <sup>3 4 1 2</sup>
Where is your house,	.. Kan keem hum to doon, .. <sup>1 2 3 4 1 2 3</sup>	.. K, herung k, hangba kangdoo, .. <sup>1 2 3</sup>	.. Gnan keon go nee. <sup>1 2 3</sup>
What thing is that,	.. Yo the bust to, .. <sup>1 2 3</sup>	.. Chee zok hin, .. <sup>2 1 3</sup>	.. K, ha bus hin. <sup>2 1 3</sup>
Where are they going,	.. No mee hum-beetish-beeto, .. <sup>1 2 3 4 5 3 1</sup>	.. Deebea gana do, .. <sup>4 5 3 1</sup>	.. Urteeshe go denee. <sup>4 5 3 1</sup>
When will you go to your house,	.. Kan keem o terung beeten, .. <sup>1 2 3 4 5 3 1</sup>	.. K, herung k, hangba la nam .. <sup>2 2 3 1</sup>	.. Gna keom un enoo <sup>2</sup>
Give this to him,	.. Yo no pung ran, .. <sup>1 2 4 3 1</sup>	.. doen, .. <sup>2 4 3 1</sup>	.. denoo. <sup>4 1 4 3 1</sup>
	..	.. D, hee p, hayee la t, hot .. <sup>1</sup>	.. Uroo daee wado, daee.

ENGLISH.	MILCHAN.	B, HOTEEA OR TARTAR.	T, HEBURSKUD.
Give me something to eat,...	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	<sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>1</sup>	<sup>4</sup> <sup>1</sup>
	{ Ungo chuta zamo ken un- grung, .. 2 }	Gna chang saja kare,	.. Zabung k,he.
Take it from him,	<sup>1</sup> <sup>2</sup> <sup>3</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>
	Noo dux kera or pung.	.. P,hagee na len,	.. Uroo chee t,hoasee.
Take up this,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>
	No pung tolao,	.. D,heela kolong,	.. Ace tek.
This is my sleeping place, ..	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup>	<sup>1</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>2</sup>	<sup>1</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup>
	Ung yangmig pusrung to, ..	D,hee gnarung nealsa hin, ..	Aee gee goojbe polung.
How far is it from this, ..	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup>	<sup>5</sup> <sup>4</sup> <sup>2</sup> <sup>1</sup> <sup>3</sup>	<sup>5</sup> <sup>4</sup> <sup>1</sup> <sup>2</sup> <sup>3</sup>
	Zhoo uks te-warik to, tera,	D,hee na t,hagring chum yot,	Aee che ene warko nee.
Take it from me,	<sup>1</sup> <sup>2</sup> <sup>3</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>	<sup>3</sup> <sup>2</sup> <sup>1</sup>
	Ung bukah kera,	.. Gnarung na k,her,	.. Geo che det.
What is the name of that	<sup>4</sup> <sup>5</sup> <sup>1</sup> <sup>3</sup> <sup>2</sup>	<sup>4</sup> <sup>5</sup> <sup>1</sup> <sup>3</sup>	<sup>4</sup> <sup>5</sup> <sup>3</sup> <sup>1</sup>
village, ..	Yo deshung the namung to,	P,hagee yool chee mheen, ..	Uro deshung meen k,ha.
What load is on your	<sup>5</sup> <sup>6</sup> <sup>2</sup> <sup>1</sup>	<sup>5</sup> <sup>6</sup> <sup>4</sup> <sup>1</sup>	<sup>5</sup> <sup>6</sup> <sup>4</sup> <sup>1</sup>
back,	Kan pooshting barung t,he	K,herung geab la chee	Gna geab to k,ha barung
	to,	K,hooroo yot,	.. nee.
Whose house is this,	<sup>4</sup> <sup>1</sup> <sup>2</sup> <sup>3</sup>	<sup>4</sup> <sup>2</sup> <sup>1</sup> <sup>1</sup>	<sup>4</sup> <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>
	No hatts keem to,	.. D,hee k,hangba-soenda-sooe	{ Ado so keoom ta aee keoom soee.
Where do you stay,	<sup>2</sup> <sup>1</sup> <sup>3</sup>	<sup>2</sup> <sup>1</sup> <sup>3</sup>	<sup>2</sup> <sup>1</sup> <sup>3</sup>
	{ Keena hum neetoon,	.. K,herung gana dutoo,	.. Gnan go pobung.
	{ ka hum busetun,	..	..

ENGLISH.	MILCHAN.	B, HOTEPA OR TARTAR.	'T, HEBURSKUD.
What like is the road, <sup>1</sup> <sup>2</sup> <sup>3</sup>	... Om hales to, ... <sup>3</sup> <sup>1</sup> <sup>2</sup> <sup>1</sup>	... Lam cheenda yot, <sup>2</sup> <sup>1</sup> <sup>3</sup> <sup>1</sup>	... Am khunea nee. <sup>3</sup> <sup>1</sup> <sup>2</sup> <sup>2</sup> <sup>1</sup> <sup>3</sup> <sup>1</sup>
Is it an ascent or descent, <sup>1</sup> <sup>2</sup> <sup>3</sup>	... Zhup to tang to, <sup>4</sup> <sup>6</sup> <sup>5</sup> <sup>3</sup>	... Gen yot thoor yot, <sup>1</sup> <sup>6</sup> <sup>5</sup> <sup>3</sup> <sup>4</sup> <sup>7</sup>	... Tang nee t, hoor nee, <sup>4</sup> <sup>6</sup> <sup>5</sup> <sup>3</sup> <sup>4</sup>
How many stages is Kanum <sup>4</sup> <sup>5</sup> <sup>6</sup>	{ Zhoo uks Kanum deshung te <sup>7</sup> <sup>8</sup>	Gana Kanum yool shakpo, ...	Aee che Kanum deshung
village from this, ...	{ days road 2 Dear om to, ... <sup>2</sup> <sup>3</sup> <sup>1</sup> <sup>4</sup> <sup>5</sup>	... Chumgee lam, <sup>3</sup> <sup>2</sup> <sup>1</sup> <sup>5</sup>	... ene dear am nee. <sup>1</sup> <sup>7</sup> <sup>8</sup> <sup>2</sup> <sup>2</sup> <sup>3</sup> <sup>1</sup> <sup>5</sup> <sup>6</sup>
In how many days shall I <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup>	Te dear o posheo Tankur <sup>6</sup>	Zhangma chum la Tankur, <sup>6</sup> to <sup>5</sup>	Ene dear chee Tankur go- <sup>4</sup>
reach Tankur fort, ...	gorung,	... K, hur la lebin, <sup>2</sup> to <sup>3</sup> <sup>4</sup>	... rung nooptee.
Give me some milk, <sup>1</sup> <sup>2</sup> <sup>3</sup>	... Ungo k, heerung toongmig keo, <sup>2</sup> to <sup>3</sup> <sup>4</sup> <sup>1</sup>	{ Gna la oma t, hoongja-tong- <sup>1</sup> kare, ...	2 to 3 4 Geo pel toongmung k, he,
Of what country are you <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup>	{ Ka hum moolk o-tontosheton, K, heerung gang yool ge mee	5 2 village 1 6	5 2 3 1 6 Gnan go moolk ge mee.
native (man,) ...			
Who built this house, <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	{ Yo keem haee-langsheet lango pangsheet, <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	3 4 1 2 3 4 1 2	3 4 1 1 2 Aee keoom soo soo lenzo.
How far is Meeroo, <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	... Teta dur to Meeroo, <sup>1</sup> <sup>2</sup> <sup>1</sup> <sup>2</sup>	4 1 2 3 1 2	4 1 2 3 Meeroo ene warko nee.
I do not understand, <sup>1</sup> <sup>2</sup>	... Ma nek, Ma ne, much 2 2 1	Me she, much 2	Ma setee. much 2
It is very cold, ...	... Up, har-oshto-lisk to ...	Mangbo tangmo, ...	Bong, k, hutkeo.



ENGLISH.	MILCHAN.	B, HOTEA OR TARTAR.	T, HEBURSKUD.
From Soongnum to Manes	1 2 3 Soongnum che Manes	2 1 3 6 Soongnum na Manes zhang-	2 1 3 Soongnum che Manes.
it is four stages,	4 5 days road dear om to, ...	5 7 ma zhee lam,	5 6 7 4 pee dear am nee.
You must give,	1 to give is Rannig dook, ...	1 2 Tocha yot, ..	1 2 Dabung nee.
There is nothing, something	1 2 T, hooch me, ...	1 2 Chang met, ..	1 2 K, huleo mane.
not, ..	2 ..	..	..
Having taken it out of the	1 2 3 4 Keem o totoa kura p, heeo, ...	3 2 1 4 K, hangba na tonne k, hoor,	3 2 1 4 Keoom un hanga ret.
house, bring it,	..	..	..
It is raining, ..	..	Chirba-cha,-gea,-Yongdook,	Chirba rugunee.
I am much pleased with you,	you with good plea- { Kanrung dam bash khoo- sure is shee to ...	Gnarung k, heourung t, ha- dook, ..	Gee gnano khooshee ranee.
For your worship,	1 2 1 Liskee sheeden, to you to do	Ogo p, heela, ..	Oone cheto. 2 from 1
You will die of cold,	... Liskee sheeden, to you to do	Tangmo sheen,	K, hatkeo soo seechbung. to you to do is
You must do, ...	... Keenoo lanmig, 2 1	Keot pecha hodo, 1 2 1	Gnano lennung nee. 2 1
To sing a song,	. Geetung lanmig, 1 2 3	Loo lepecha, loo tongzha, ..	Greb k, herbung. 1 2 does come
Why has he not come,	.. T, hoo ma boot,	Cheep, hila-cheela-mayoong,	K, hyro ma rano.

ENGLISH.	MILCHAN.	B, БОТРА ОР ТАБТАР.	T, ТЕРБЕСКУД.
Sleep (having slept sit,) ...	<sup>1</sup> Yag <sup>2</sup> yag tosh, ...	Neal <sup>1</sup> ne dot, Neal <sup>2</sup> go, ...	Goojee <sup>1</sup> po.
Having washed, bring, ...	<sup>1</sup> Chee <sup>2</sup> chee <sup>3</sup> kura, ...	{ T, hoo <sup>1</sup> la <sup>2</sup> k, hila, <sup>3</sup> t, hoo <sup>1</sup> ne } { k, hoo <sup>2</sup> t, hoo <sup>3</sup> chur <sup>1</sup> k, hoo, }	{ 2 <sup>1</sup> 3 <sup>2</sup> 1 <sup>3</sup> } Oorga ret, oorka ret.
Let it dry, ...	<sup>1</sup> Charashet, ...	Kam <sup>2</sup> chook, Kamdo <sup>1</sup> chook, ...	P, ho mat.
What is you caste, ...	<sup>1</sup> Kan the zat to, ...	Keot <sup>3</sup> chee <sup>1</sup> rikh <sup>2</sup> hin, ...	Gnan ka zat.
Give it to whom it belongs, ...	Hatto <sup>1</sup> ung to no rannae shet, ...	{ who <sup>2</sup> is him to give him } { K, hoee <sup>1</sup> hin <sup>2</sup> te <sup>3</sup> la <sup>4</sup> t, hot pha. }	{ who <sup>2</sup> is to him give } { See <sup>3</sup> hin <sup>1</sup> wado <sup>4</sup> daee. }
Having made, bring, ...	<sup>1</sup> Lan <sup>2</sup> lan <sup>3</sup> kera, ...	Zo <sup>2</sup> la <sup>1</sup> k, hela, zo <sup>2</sup> ne <sup>3</sup> k, hoo, ...	Lenga ret,
Is there oil or not, ...	{ Telung to mae, Telung } doo madoo, ...	Markoo <sup>2</sup> dooga <sup>1</sup> me <sup>4</sup> doog, ...	Matee <sup>2</sup> nee <sup>1</sup> la mane.
Tell me (bring word,) ...	<sup>1</sup> Batung <sup>2</sup> kera, ...	Kucha <sup>2</sup> k, hoo, ...	Kucha re.
Run (having run go,) ...	<sup>1</sup> D, hyat <sup>2</sup> bee, ...	Geookh <sup>1</sup> ne song, ...	Boetka de.
What are you saying, ...	{ Kas <sup>2</sup> t, he <sup>1</sup> ringon, }	K, heourung <sup>2</sup> chee <sup>1</sup> lupchee ...	K, ha ringbung.
What have you said, ...	<sup>1</sup> Noo <sup>2</sup> den <sup>3</sup> tas, ...	Dhee <sup>3</sup> khatookla, por, ...	Yoose choopcho tae.
Place it on this, ...			

ENGLISH.	MILCHAM.	B,NOTRA OR TARTAR.	T,HEBVRUKUD.
Do not come again,	<sup>1</sup> <sup>2</sup> <sup>3</sup>	..	<sup>3</sup> <sup>1</sup> <sup>2</sup> Neka t,ha raeechee.
What shall I do,	<sup>1</sup> <sup>2</sup> <sup>3</sup>	..	.. K,ha lenmung.
It is dry,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	..	.. P,ho nee, P,hoka nee.
From whence have you come,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	..	.. Go che rano.
Why has he not obeyed my	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	..	.. Gee hookum k,hyro ma
orders,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	..	.. muneat, .. munanee.
It is burnt,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup>	..	.. Tooka yot Barga yot, .. Rotka nee.
I am not going any where,..	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup>	..	.. Ganeung me dogan, .. Goo ma dencee.
If I come to your house what	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. Gnarung keotkee khangba Gee gnan keoorn un ranee
will you give me to eat,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. la yongen chee saja tangin, kha zabung k,henoo.
Now he has sit down in the	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. Ta k,hangba roo dot song, .. Lisungo keoomun poka.
house,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	..
Please to sit down,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. Dot chee, Dotochee, .. Po chee.
Call him,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. P,hagee la kut-geop, ... Uroo hot.
What is he sowing,	<sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5</sup> <sup>6</sup> <sup>7</sup> <sup>8</sup>	..	.. P,hagee chee tapge, .. Uroo k,ha peetee.

Why have you broken this plate?	Yo derma chera choongon,	D, hee derma cheephila chak-Aee derma k, byro keaka
at another time take care,	nepeks thulun ral mace	songe dalda tacheek me k, he- dulda kan chee manee
otherwise I will beat you,	kanrung satook,	ourung satin, .. gnano sattee.
I have given this person 20	Neera roopeea choa zongmig	Mool neeshoo d, heela tatsong Neera roopeea broo chong-
rupees to buy grain, ...	zhola ranook or rak,	jukhpe neozha, ... bung wado, daee.
Will you stay or go,	Tosheten kee beeten,	will you go will you stay
Do you understand or not?	Toshen kee beeten,	Dozhan docha, ..
(did you understand)	Neten a ma nen,	Doene-doten or dotoen.
Will you go, or not,	Beeto kee ma been,	She me she, ..
Will he come, or not,	Booto kee ma boot,	Shekane me shezhe, ..
Shall I come, or not,	Booko ma book,	Doene me do, ..
Have you got, or not,	Puruna ma puran,	Denoola potan.
		1 or 2 1
		.. Sela ma seno.
		.. De la ma denoo.
		1 2 3 1
		.. Ra la ma ramee.
		.. Nootpung ma nootpung.
		1 2 3 1
		.. Puracho la ma purat.

ENGLISH.	MILCHAN.	B, HOTTA OR TARTAR.	T, HESURKUD.
Have you eat or not, <sup>1</sup> <sub>2</sub>	<sup>1</sup> 2 <sup>1</sup> Zana ma san, ..	<sup>1</sup> 2 <sup>1</sup> 1 <sup>2</sup> 1 .. Saong ma sa, sa ma sa,	<sup>1</sup> or 2 <sup>1</sup> .. Zaga la ma zaga.
Has he eat or not, <sup>1</sup> <sub>2</sub>	... Za ma sa, ..	.. Saong ma sa, ..	.. Zaga mae,
This is better, This is best, ...	<sup>1</sup> very 3 good 4 2 ... } Yo up, har dam to,	<sup>1</sup> 3 4 2 Dhee mangbo gamo yot,	<sup>1</sup> 3 4 2 .. Yooee bong epo nee.
Drops are falling, <sup>1</sup> <sub>2</sub>	... Oahungbudodoo, lugdodoo, ..	<sup>1</sup> 2 T'hikpa yooantook, ..	<sup>1</sup> 2 .. Chokchee rugunee.

## MILCHAN.

The Substantives seem to be of the neuter gender, unless animals, for which there are either different words, or the sexes are distinguished by the adjectives male and female.

The cases are marked by terminations, and are :—

Nominative,	Keem, a house.
Genitive,	Keem-o, of a house.
Dative,	Keem-a-nung to into, for a house.
Accusative,	n, a house, or on a house.
Ablative,	{ Keem-ung-rung, with a house.
Nominative,	{ Keem-che-uka-na-no, from a house.
Genitive,	Ung, I, myself.
Dative,	Ung-o, mine, of me.
Accusative,	Ung-o-lo-rung-pung, to, for me.
Ablative,	Ung-rung-pung-en-oon, me, or upon me.
	{ Ung-che-duka-buka-na-no, from me.
	{ Ung-dung-rung, with me.

The cases appear to be the same in the plural, but *a* is sometimes added to nouns ending in a consonant, as *Keema*, "houses." *Keemapung*, to "houses," she signifying all, is likewise added to denote the plural, but it is most generally omitted.

The adjectives have no gender, and I have been able to find no degree of comparison, unless *Uphar*, signifying "very," as *Uphar oarik*, "very, more or most distant."

The imperative singular, which is sometimes a substantive, is the root of a verb, and from it the other tenses are formed.

All infinitives end in *mig* or *nig*, and by dropping these terminations you get the imperative singulars, with a few exceptions; *o* added to the singular forms the plural, but if great respect be meant, *en* or *chee*, and often both used instead of *o*.

When there is a vowel before *mig* after that termination, has been dropped for *n*, is sometimes added for the imperative singular, but if that vowel be *a*, *ee* is commonly added, and if *mig* follow an *m* or *n*, these letters are usually changed into *p* or *t*.

Toshmig, to sit,	Kemig, to give,	Beemig, to go.
Tosh, sit thou,	Ken, give thou,	Bee, go thou.
Tosho, sit you,	Keno give you,	Beeo, go you.
Toshen, } please to sit,	Kenchee, please to give,	Beeochee, please to go.
Toshenchee, }	Tha-ken, do not give,	Tha-boeo, do not go.
Tha-tosh, Do not sit.		
Sanmig, to kill,	Dammig, to pull,	Toamig, } to take up, Kooing, to call.
Sat, kill thou,	Dap, pull thou,	Toanmig,
Satosano, kill you,	Dapo, pull you,	Toaee take up thou, Koon, koot, call thou.
		Tono, take up you, Koono, kooto, call you.

PRESENT.

The first person singular of the present tense, is formed by adding " tok, took, tuk, dok or dook," to the imperative singular, and dropping *n*, *p*, *t* or *ee*, if it end in either of these letters.

The 2d person,	by adding	toon, ton, don, doon,
" 3d "	"	to, ta, too, do, or doo.
The 1st person plural,	"	te, tesh, de, desh or dish,
" 2d. "	"	tesh, tish, ten, den, desh, dish,
" 3d. "	"	tesh, tosh, desh, te or de,

	Toshmig, to sit.	Lanmig, to do.	
Goo or Goos,	Toshetook, or Toshetok,	I sit, Landook or Lanodok,	I do,
Kee " Ka,	Toshetoon, " Tosheton,	thou sittest, Landoon " Lanodon,	thou dost.
No " Nos-Zho,	Toshetoo, " Toshetu,	he sits, Landoo " Lanodo,	he does.
Kishung,	Toshete, " Toshetosh,	we sit, Lande " Lanodesh,	we do.
Keena-kees,	Tosheten, " Toshetish,	you sit, Landen " Lanodesh,	you do.
No-nogonda,	Toshete. " Toshetosh,	they sit, Lande " Lanodish,	they do.
Goo,	Ma-toshetuk or Toshetook,	I am not sitting, Ma lanodok, &c.	I do not do, &c.

	Beemig, to go.	Sanmig, to kill.	
Goo or Goos,	beetook or beetuk,	I go, Satcok or Satuk,	I kill.
Ka " Kas,	beeton " beetun,	thou goest, Satoon " Satun,	thou killest.
No " Nos,	beeto " beeta,	he goes, Satoo " Sata,	he kills.
Kishnug,	beete " beetish,	we go, Sate " Satesh,	we kill.
Keena,	beeten " beetish,	you go, Saten " Satesh,	you kill.
Nogonda,	beete " beetesh,	they go, Sate " Satesh,	they kill.

PERFECT.

The first person singular of the Perfect, is formed by adding "ok, ek, ook or uk," to the imperative singular, if it end in a consonant; but should it be a vowel *k* or *rok* is added.

The 2d person singular by adding a, on, oon, un or after a vowel n or ron,  
a or o after a consonant, and k, t, c or ro, after a vowel.

3d " plural, e, esh or re,  
1st " en or ren,  
2d " e, re esh or resh.  
3d "

Ranmig, to gvie.		Boonmig, to come.		Lanmig, to do.	
Goos rak,	I gave	Book,	I have come,	Lanook or Lanok,	I have done.
Kas ran,	thou gavest,	Boon or booa,	thou,	Lanoon ,, Lanon,	thou, &c.
Nos rat,	he gave,	Boot or booa,	he,	Lanoo ,, Lano,	
Kishung ranne,	we gave,	Booe,	we,	Lane ,, Lanesh,	
Kees rannen.	you gave,	Booen,	you,	Lanen,	
Nos ranne,	they gave, [&c. Booe,		they,	Lane Lanesh,	
ma rak,	I have not given,			Ma lanook,	I have not done.

Lonmig, to speak.		Toshmig, to sit.		Sanmig, to kill,	
Goos lorok or lok,	I spoke,	Toshuk or Toshek,	I sat,	Sak or Sanook,	I killed, &c.
Kas loron ,, lora,	thou, &c.	Toshun,	thou, &c.	San ,, Sanon,	
Nos loro ,, lok.		Tosho,		Sat ,, Sano,	
Kishung lore,, loresh,		Toshe ,, Toshesh,		Sane,	
Kees loren,		Toshen,		Sanen,	
Nos lore ,, loresh,		Toshesh ,, Toshe		Sane,	



The future is the same as the present, unless sometimes in the following instances, where the perfect is used :—  
Goos rak, shall I give,                      Makek, I will not give.  
Kees lanon, will you do,                    Ma book, I will not come, &c.

In the above a great deal depends upon the tone of voice and action.  
The following are more common.

Beetena ma been, will you go or not (will you go, or have you not gone.)  
Rantook ma ranook, shall I give or not (shall I give, or have I not given.)

The perfect is used for the imperfect and pluperfect.  
Must is supplied by the infinitive as,  
Ungo beemig dook,    I must go, (to me it is to go,)  
Keeno lanmig dook,    you must do, (to you it is to do,)  
Nopung ranmig dook,    he must give, (&c.)

PARTICIPLES.

The present participle is formed by adding *a* to the imperative singular.  
Tosha, sitting,                      Lona, speaking.

The perfect participle is either the imperative singular alone, or repeated or, *eo*, *keo*, *geo*, or *ka* added to it.  
♣ Charmig, to dry,                      Chargeo, dry,                      Tookmig, to break,                      Took took, broken or having broken.  
♠ Cheemig, to wash,                    Cheechee, washed,                  Beenmig, to burn,                    Beetkeo, burnt,  
Sanmig, to beat,                      Sat Satka,                      Satkeo, beaten,

The active verbs are sometimes formed from the perfect participle, with the assistance of Shenmig, to place, Lanmig, to do; and Ranmig, to give.

Sanmig,	} to beat,	Cheeramig,	} to split.	Tongmig,	} to open.
Sa-shenmig,		Cheera-lanmig,		Tong-ranmig,	
Sa-shet,	} beat thou.	Cheeralan,	} split thou.	Tong ran	} open thou.
Sa-sa-shet,				Tong-tong ran	

Sa shetok, I beat,

Cheera lanodook, I split,

Tong ranotook, I open.

Sa shenook, I have beaten.

Cheera lanook, I have split.

Tong rak, I have opened.

The passive is formed by the auxiliary verbs to be and go.

Sanmig, to beat.

Beenmig, to burn.

Thasmig, to hear.

Goo sasa dook, I am beaten.

Beetkeo took, I am burned.

Thaska took, I am heard.

Ka sasa doon, Thou, &c.

Beetkeo ton, Thou, &c.

Thaska toon, Thou, &c.

No sasa doo,

Beetkeo to,

Thaska to,

Kishung sasade,

Beetkeo te,

Thaska te,

Kee sasaden,

Beetkeo ten,

Thaska ten,

No sa sade,

Beetkeo te,

Thaska te,

Goo sa beek, I have been beaten,

Beet or beetkeo-beek, I have, &c.

Thas beek, I have been, &c.

Ka sa or satke been, Thou, &c.

Beet been,

Thas been,

No sat or satka beeo,

Beet beeo,

Thas beeo,

The tenses might be formed by any of the above terminations, but those only which sound best are used ; thus in the verbs Ranmig and Lonmig, the perfect might be Rank and Lonk, but Ranook, Rak, Lonook, Lorok and Lok are softer, and therefore are in use ; after *n, g* is sometimes inserted, as Rangook, &c.

In the tenses of verbs, as well as in whole sentences, the Koonawurees pay the greatest regard to sound ; consonants are often separated by *a, e* or *o* *t* and *d, k* and *g* are interchanged, and *d, n, p, t* are usually placed between two vowels, and as often omitted if one word end with a consonant, and either of these letters follow in the next ; thus—Toshe-took and Lanodook, are used instead of Toshtook and Lantook, Chargeo and Satka are softer than Charkeo and Satga, and in the following:

Nodo, Nopung, to him.

Keemo, Keemung, to a house not Keemdo, Keempung.

Noduks, Noche, from him but.

Keemuks, Keemoduks, Keemoche, never Keemduks, Keemche.

Kano, Kalo, to you ; are used in place of Kao and Kanlo.

Sat is the imperative of Sanmig, but Sashet is softer than Satshet, and Chara sehmgig is better than Char shemig ; many more instances might be given.

ash, ish, tesh, tish, in the plural are used respectfully.

## B, HOTEHA or TARTAR.

Like the Milchan the cases of the nouns are distinguished by terminations, and the adjectives have only one degree of Comparison, Mangbo, signifying much, being prefixed.

Nominative,	Yool, a village.
Genitive,	Yoolge, of a village.
Dative,	Yool-roo-la-doo-le, to, for, into a village.
Accusative,	Yool-la, a village.
Ablative,	Yool-laroo, with a village.
	Yool-na-soo, from a village.

The plural is the same.

The infinitive of a verb ends in *cha*, *ja*, or *zha*.

The imperative singular is formed by dropping the final terminations, but if the infinitive end in *cha* with a vowel before it, *t* is added; perhaps it would be more simple if *cha* were written *tzha* or *tscha*, as it is pronounced; if the infinitive be *kecha* or *keja*, *k* is added, after dropping the final terminations, and *e* or *a* is sometimes added to form the imperative singular; the addition of *o* makes the plural; and *chee* denotes respect, as in the Milchan.

The infinitive is used for the imperative, but very seldom.

Shokja, to come,	Docha, to sit,	Cheezha, to wash.
Shokh, come thou,	Dot, sit thou,	Chee, wash thou.
Shokha come you	Doto, sit you,	Checo, wash you.
	Dottee, please to sit,	Meechee, do not wash.
Meshokh, do not come,	Ma dot, do not sit,	
Chakcha, to cut,	Karzha, to give,	Khelzha, to bring.
Chakh, cut thou, &c.	Kare, give thou.	Khela, bring thou.

There are two present tenses, the most common is as follows:—

The 1st person singular, by adding *ghan* or *gan* to the imperative singular, or the infinitive is made use of.

The 2d person singular, by adding *ghan*, *gan*, *ghane* or *gane*, or the infinitive.

The 3d	„	„	ghan, gan, ghe or ge, or the infinitive.
1st	„	plural.	ghen or gen, or the infinitive with the addition of <i>n</i> .
2d	„	„	ghen or gen, or the infinitive with the last letter changed into <i>e</i> .
3d	„	„	ghen or gen, or the infinitive, as in the 2d person.

If the infinitive end in *t*, that letter is generally omitted, but it is retained in *docha*, to distinguish it from *dozha*, *g* and *k*, *p* and *be*, *t* and *d* are interchanged, and *o* is often placed between two consonants; this tense is sometimes used for the future.

Dozha, to go,

Pecha, to do.

Gna,	Doghan,	Dogan, I go,	Pekan,	Pecha,	I do,
Keot,	Doghane,	Doghan, thou goest,	Pekane,	Pecha,	Thou doest.
Phaee,	Doghan,	Doghe, he goes,	Pekan,	Peke, Pecha,	He does.
Net,	Doghen,	We go,	Peken,	Pechan,	We do.
Keozhuk,	Doghen,	Dozhe you go,	Peken,	Pече,	You do.
Wateshe,	Doghen,	They go,	Peken,		They do.
	Me doghan,	I do not go, &c.			
	Docha, to sit,			Songzha, to go; the g is not doubled.	
Gna,	Dotkan,	I sit,	Songan,	Songzha,	I go.
Keot,	Dotkane,	Thou sittest,	Songan,	Songzha,	Thou goest.
Phagee,	Dotke,	He sits,	Songe,	Songzha,	He goes.
Net,	Dotken,	We sit,	Songen,	Songzhan,	We go.
Keozhuk,	Dotken,	You sit,	Songen,	Songzhe,	You go.
Wateshe,	Dotken,	They sit.	Songen,	Songzbe,	They go.

The other present is formed as follows:—

1st person singular by adding *oon* or *oong* to the imperative singular.

2d.	„	„	o, oo, ook or n.
3d.	„	„	ook, oon, oong or dook.

1st	„	plural	„	oon or oong.
2d.	„	„	„	oon or oong.
3d.	„	„	„	o, oon or oong or the infinitive with him.

Sheezha, to die.		Toongzha, to sing.	
Gna,	Sheeoong, I am dying,	Tongoon,	I am singing.
Keot,	Sheeook, sheeo, sheen, thou, &c.	Tongoo,	Thou, &c.
Phagee,	Sheeook, sheeoong,	Tongoon, Tongodook.	
Net,	Sheeoong,	Tongoon.	
Keazhuk	Sheeoong,	Tongoon,	
Wateshe,	Sheeoong sheeo,	Tongoon, Tongzha hin.	
		Me tongoon,	I am not singing.

IMPERFECT.

1st person singular imperative alone, or with the addition of a	e
2d.	„
3d.	„
1st	Imperative alone or with o
2d.	„
3d.	Imperative plural.
	„
	singular.

Songzha, to go,	Tacha, to give.
Gna,	Tat, I did give.
Keot,	Tat, Thou, &c.
Phaee,	Tato.
Net,	Tat.

Keozhuk, Wateshe,	Songo, Song, Me song, I did not go.	Tato. Tat.
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PERFECT.

The perfect is the imperative singular with the addition of song ; throughout *a* is sometimes added to the 1st person singular, &c. to the 2d persons singular and plural.

Gna	Phoosong,	Phoosonga,	I have gone.
Keot,	Phoosong,	Phoosonge,	Thou, &c.
Phaee,	Phoosong,		
Net,	Phoosong,		
Keozhuk,	Phoosong,	Phoosonge,	
Wateshe,	Phoosong,		

Tacha, to give.  
Tut song, I have given.  
Tat songe, Thou.  
Tat song.  
Tat song.  
Tat songe,  
Tat song,  
Me tatsong, I have not given.

FUTURE.

The future is formed by adding *en* to the imperative singular, unless in the 2nd and 3rd persons singular, the former of which is by the addition of *ene* and the latter by *e*; after *t* the *en* becomes *oen*.

Zozha, to do.	Docha, to sit.
Gna zoen,	Dotoen, I will sit.
Keot zoene,	Dotoene,
Phaee zoe,	Dotoe,
Net zoen,	Dotoen,
Keozhuk zoen,	Dotoen,
Wateshe zoen,	Dotoen,

PARTICIPLEs.

The present participle is formed by *a*, the perfect by *ta* or *pa*, and the compound perfect by *la*, *chur*, *jur* or *ne* added to the imperative singular.

Docha, to sit.	T,hoozha, to wash,	P,herzha, to fall.
Dota, sitting,	T,hooa, washing,	P,hera, falling.
Dotka, sat,	T,hooka, washed,	P,herka pherpa, fallen.
Dochur, having sat,	T,hoone, } Having washed,	P,herne, } having fallen.
	T,hoojur	P,herchur,
	T,hoola,	

In a negative sense the imperative is used at times for all the tenses.

as Me zo,	{ I do not,	{ I do not give.
	{ I will not do, or shall I do,	{ I will not give.
	{ I have not done.	{ I have not given.
	Me tat,	

The imperative is frequently used with the following verbs, Tongzha, Zerja, Geoopcha, and Kozha.

Tonzha,	Chongzha	to sell.
Tontongzha,	Chong geoopcha,	
Tontongan,	Chang geoopkan,	I sell.
Tontong,	Chong geoop,	I did sell.
Tontongson,	Chong geoop song,	I have sold.
Tontongen,	Chong geoop chee,	please to sell.
Tontong,	Ma chong geoop,	he will not sell, &c.
Metontong,		
Shokzha, ..	Zheekcha, ...	to fear.
Shok zerja, ..	Zheek ko zha,	
Shok zerin,	Ma zheek chee,	do not fear.
Shok zersonge,	Zheek me ko,	
Shok ma ser,	&c.	

The passive is formed by the perfect participle and the auxiliary verbs, yozha, to be; and songzha, to go; I have only discovered two tenses.

Chorzha, to hear.	Present.	Barzha, to burn.
Chorka yoon,	I am heard.	Barga yoon, I am burned.
Chorka, yoze, Chorka yot,	thou heard.	Barga yoze.
Chorka yot, Chorka dook,	he is heard, &c.	Barga yot, &c.
Chorka yoon, Chorka yot,		
Chorka yot, Chorka yoze,		
Chorka yot,		
PERFECT.		
Sat ka song, I have been beaten,		Barga song, I have been burned.
Satka songe &c.		Barga songe, &c.
Me satka song, } he has not been beaten,		
Satka, me song, }		

THEBURSKUD.

The cases of nouns are:

Nominative,	Shung, a horse.
Genitive,	Shunge, shungke, of a horse.
Dative,	Shung-o-do-to-goon, un-na to, for a horse.
Accusative,	Shung-to chopcho, a horse, upon a horse.
Ablative,	{ Shung-che-chee-soo-un, from a horse.
	{ Shung-dung, with a horse.

The plural is the same.  
 The adjectives have one degree of comparison, Bong, meaning more or most being prefixed.  
 The infinitives of verbs end in *mung*. *pung* or *bug*; and the imperative singular is formed as in the other languages



by dropping these terminations, after *a*, *ee* is added, and *a* sometimes follows a consonant; the addition of *o* makes the plural, and *n* after a vowel, or *en* after a consonant, and *chee* denote respect; the infinitive is also occasionally used for the imperative.

Bujabung, to beat.  
 Bujae, beat thou.  
 Bujaeo, } beat you.  
 Bujao, }  
 The bujae, do not beat.  
 Kekshbung, to fall.  
 Ma keksha, } do not fall.  
 The kekshbung, }

Moochamung, to knead.  
 Moochae, knead thou.  
 Moochaeo, knead you.  
 { Moochae chee, } please to knead.  
 { Moochaeen, }  
 Reebung, to fall.  
 { Ma reeachee, } do not fall.  
 { The reaeen, }

PRESENT.

The present tense, which is also the future, is formed

1st person singular by adding nee, tee, dee, to the imperative.	
2d       "       "	noola, toola, doola, tanla, danla.
3d       "       "	nee, tee, dee, neela, tala, deela, dala.
1st       "       plural	nee, tee, dee.
2d       "       "	no, noo, nun, to, too, tan, do, doo, dan.
3d       "       "	nee, tee, dee.

<sup>a</sup> The infinitive is also used for the 1st, 2d and 3d persons singular, if the verb end in *tpung*, *t* and *p* are interchanged sometimes.

Debung, to go.

Sepung, to know.

Gee denee, debung, I go,  
 Gnan denoola, debung, Thou goest.

Setee, sepung, I know, &c.  
 Setoola, setanla.

Uroo deneela, denee, debung,..	he goes,	Setee, setala, seteela.
Eneshe denee, .. .. .	we go,	Setee,
Gnanee she deno, denoo, denan, you go,		Seto, setoo, setan.
Urteashe denee, .. .. .	they go,	Setee.
Ma denee, .. .. .	I will not go.	

Lenmung, to do.	Nootpung, to come.
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Gee lende, lenmung,..	.. .. .	I do,	Nooptee, I come.
Gnan lendoola, lendaala, ..	.. .. .	thou, &c.	Nooptoola, thou, &c.
Uroo lende, lendaala, lendeela, ..			Nooptala.
Eneshe lende, .. .. .	.. .. .		Nooptee.
Gnaneeshe lendo, lendoo, lendun,			Noopto.
Urteashe lende, .. .. .	.. .. .		Nooptee.

PERFECT OR IMPERFECT.

The person is formed as follows:—

1st person singular by adding	kee	or	gee, to the imperative.
2d	"	ka	or ga.
3d	"	ka	or ga, or the imperative alone.
1st plural,	cho	or zo	} or the imperative.
2d	cho	or zo	
3d	cho	or zo	

Dabung, to give.	Satpung, to kill.
Gee dagee, I have given.	Sakee, I have killed, &c.
Gnan daga, thou, &c.	Satka.
Uroo daga, dace,	Sat, satka.

Enshe dacho, dazo, daee,  
Gnaneeshe dacho, dazo,  
Urteesho, dazo,

Sacho.  
Sacho.  
Sacho.

With *ma*, the perfect is often used as the future and present, as *Ma dagee*, I am not giving, I have not given, I will not give.  
The imperative is also used in the same sense, and in asking a question, *Ma daee*, I will not give, &c., *daee*, did he give, or shall I give.  
The present participle is the imperative alone, or with the addition of *a*; the perfect is formed by adding *ka*, and the compound perfect by adding *ka* or *e*.

De, going.  
Deke, gone, having gone.  
.. ..

Lena, doing.  
Lenga, done.  
Lenga, lene, having done.

The imperative, present or perfect participles, are sometimes used with the verbs *kherbung*, *tatpung*, and *geomung*.

Ploota kherbung, to let go.  
Poka tatpung, to sit down.  
Gear geomung, to fear.

The passive is formed by the imperative alone, or with the addition of *ka* or *cha*, and the verbs to be and go.  
Gee sacha, satha-nee, I am beaten.                      Sat, satka degee, I have been beaten.  
Gnan sacha nee, &c.

There is a dialect peculiar to the small district of Zhungram. I believe the words are the same as the Milchan, but the infinitives of the verbs end in *ens*, the following are a few of them:—

To eat,              Zaens.  
drink,              Toongens.  
sit,                  Posens.  
give,                Khedens.  
speak,              Chulens.

The dialect spoken in the district of Soomchoo, differs from the others, principally in the tenses of the verbs, but some of the words are likewise different. The following are a few :—

ENGLISH.	SOOMCHOO.	ENGLISH.	SOOMCHOO.	ENGLISH.	SOOMCHOO.
Man, ...	.. Mee.	Dog, ..	.. K,hoee.	Finger, ..	.. Branch.
Woman, ..	.. Esplung.	Cat, ..	.. Peeshee.	Foot, ..	.. Bunkun.
Carpenter, ..	.. Oris.	Monkey, ..	.. Bundrus.	Back, ..	.. Geab.
Shoemaker, ..	.. Chamung.	Mouse, ..	.. Peeoots.	Hair, ..	.. Kra.
Blacksmith, ..	.. Domung.	Snake, ..	.. Sabas.	Egg, ..	.. Leelee.
Shepherd, ...	.. Palis.	Hare, ..	.. Reehong.	Heat, ..	.. Kochra.
Thief, ..	.. Chorus.	Fish, ..	.. Muchus.	Cold, ..	.. Khutee.
Ferryman, ..	.. Turoo.	Bird, ...	.. Peeach.	Apple, ..	.. Kooshoo.
Yak, ..	.. Yak.	Hawk, ..	.. Paree.	Grape, ..	.. Goon.
Ass, ..	.. P,hoch.	Chukor, ..	.. Kokchera.	Honey, ..	.. Brangsee.
Horse, ..	.. Shung.	Pigeon, ..	.. Pekhra.	Tobacco, ..	.. Tumak.
Bear, ..	.. Hom.	Kite, ..	.. Goldus.	Butter, ..	.. Mar.
Bull, ..	.. Eting.	Bee, ..	.. Brangsee beeing.	Snuffs, ..	.. Nusar.
Cow, ..	.. Rat.	Head, ..	.. Peesha.	Oil, ..	.. Matee.
Sheep, ..	.. Brang.	Throat, ..	.. Golung.	Spirits, ..	.. Rak.
Wedder, ..	.. Kar.	Tooth, ..	.. Soa.	Bees' Wax, ..	.. Seetung.
Mule, ..	.. Teeoo.	Tongue, ..	.. Le.	Coarse Sugar, ..	.. Gooram.
Goat, ..	.. La.	Mouth, ..	.. Akhot.	Milk, ..	.. Pel.
Female Yak, ..	.. Breemo.	Beard, ..	.. Daree,	Musk, ..	.. Katrung.
Male, between yak } Zofo.		Mustachio, ..	.. Wasung.	Fine Sugar, ..	.. Shakrung.
and cow, ..		Nose, ..	.. Mor.	Poison, ..	.. Beeshung.
Female, ditto ditto, Zomo.		Ear, ..	.. Repung.	Tea, ..	.. Cha.
Musk Deer, ..	.. Roch.	Eye, ..	.. Mee.	Apricot, ..	.. Choollee.
Hog, ..	.. Soorpa.	Arm, ..	.. God.	Walnut, ..	.. Kat.

English.	Soomchoo.	English.	Soomchoo.	English.	Soomchoo.
Wine, ..	Greeng.	Plough, ..	Halas.	Iron, ..	Chuka.
Sun, ..	Neemook.	Fort, ..	.. Gorung, Khur.	Brass, ..	Peetul.
Moon, ..	Gulsung.	Flat Roof, ..	.. K, heam.	Lead, ..	Seek.
Star, ..	Karma.	Slanting Roof,	.. Chuprung.	Mercury, ..	Mulchoo.
Cloud, ..	Zhoo.	Field, ..	.. Ree.	Borax, ..	Challe.
Water, ..	Tee.	Cotton, ..	.. Rooee.	Sulphur, ..	Gunik.
Snow, ..	Rus.	Wood, ..	.. Sheeng.	Cannon, ..	Top.
Rain, ..	Mookpa.	Flower, ..	.. Mentok.	Matchlock,	Nal.
River, ..	Sumudrung.	Straw, ..	.. Boko.	Spear, ..	Burcha.
Rivulet, ..	Loonpa.	Smoking Pipe,	.. Gungsa.	Bow, ..	Zhoo.
Lightning,	.. Bijil.	Skin for crossing	} Mushkee.	Arrows, ..	Shim.
Thunder, ..	.. Goorgootee.	rivers, ..		Shield, ..	D, hal.
Ice, ..	.. Shanung.	Brass Pot,	.. Lotree.	Sabre, ..	Troosal.
Village, ..	.. Deshung.	Cloth Tent,	.. Koor.	Leaden Ball,	Goolee.
House, ..	.. Keem.	Skin for flour,	.. K, hoolch.	Gunpowder,	Daroo.
Road, ..	.. Om.	Steel for striking fire, Mekcha.	.. T, hakpa.	Fiddle, ..	Dutaree.
Fire, ..	.. Me.	Rope, ..	.. Shunglung.	Trumpet, ..	Kunal, runsheeng.
Year, ..	.. Bursung,	Iron Chain,	.. Pore.	Wool, ..	Cham.
Day, ..	.. Ner.	Pair of Scales,	.. Jajree.	Cap, ..	Tepung.
Night, ..	.. Moonea.	Hooka, ..	.. Lashta, tok, bee.	Shoe, ..	Bulrun.
Month, ..	.. La.	Axe, ..	.. Keooch.	Blanket, ..	Neanglook.
Tree, ..	.. Botung.	Adze, ..	.. Retur.	Garment of sheep- skin, ..	} Lakpa.
Hill, (large,) ..	.. Yooee.	Saw, ..	.. Sak, hool.		
Range, ..	.. Gang.	Bellows, ..	.. K, hoorts.	Ditto of Goat's hair, K, heear.	
A God, ..	.. Sat.	Knife, ..	.. Zung, ser.	Ditto of Blanket, ..	Chooba.
Lama's Temple, ..	.. Chokten.	Gold, ..	.. Mool.	Gloves, ..	Goosub.
Hand Mill,	.. Gotung.	Silver, ..		Here, ..	Oea.

ENGLISH.	SOOMCHOO.	ENGLISH.	SOOMCHOO.	ENGLISH.	SOOMCHOO.
There, ..	.. Noa.	11	.. Sahud.	To fall, ..	.. Brinjema.
How many, ..	.. Tuche.	12	.. Saneesh.	„ beat, ..	.. Koolma.
Yes, ..	.. O.	13	.. Sahoom.	„ ask, ..	.. T,hama.
No, ..	.. Mato.	14	.. Sapoo.	„ arrive,..	.. Pusma.
Quickly, ..	.. Hal.	15	.. Sanga.	„ give, ..	.. K,hemma.
Below, ..	.. Opung.	16	.. Satoo.	„ laugh, ..	.. Wanma.
I, ..	.. Goo.	17	.. Sashooneesh.	„ break, ..	.. T,hama.
Thou, ..	.. Ka.	18	.. Sarge.	„ dig, ..	.. Kotama.
He, ..	.. Onomee.	19	.. Sagoo.	„ go, ..	.. Zhema.
You, ..	.. Georung.	20	.. Neesa.	„ speak, ..	.. Chulma.
White, ..	.. Chang.	30	.. Deoneesa.	„ fight, ..	.. Matashma.
Black, ..	.. K,haee.	40	.. Neeshneesa.	„ dwell, ..	.. Busunma.
Good, ..	.. Epo.	50	.. Dyneesa.	„ fear, ..	.. Bema.
Bad, ..	.. Kochung.	60	.. Hoomneesa.	„ write, ..	.. Chema.
Large, ..	.. Che.	70	.. Hoomneesa sa.	„ read, ..	.. Purusma.
Small, ..	.. Chigich.	80	.. Pooneesa.	„ ride, ..	.. Shokshma.
		90	.. Pooneesa sa.	„ sleep, ..	.. Neanma.
		100	.. Gea.	„ see, ..	.. K,honma.
1	.. Eet.	1000	.. Tong.	„ do, ..	.. Lamma.
2	.. Neesh.	The days of the week and months are			.. Greb-lamma.
3	.. Hoom.	the same as the Milchan.			.. Lanma.
4	.. Poo.			„ cook, ..	.. Ponma.
5	.. Gna.			„ sew, ..	.. Leama.
6	.. Took.	To kill, ..	.. Sanma.	„ bring, ..	.. Pusma.
7	.. Shooneesh.	„ run, ..	.. Geanma.	„ stay, ..	.. Kearma.
8	.. Ket.	„ eat, ..	.. Zama.	„ weigh, ..	.. Ronma.
9	.. Goo.	„ drink, ..	.. Toongma.	„ burn, ..	.. Zango zhema.
10	.. Ha.	„ sit, ..	.. Poama.	„ drown,	

English.	Soomchoo.				English.	Soomchoo.		
What is the name of that village, ...	1 2 3 4	5	4	3	What are you eating, I am going, .. Thou art going, ..	1 2 3	2 1 3	Ka the zatun. Goo zhetok. Ka zhetuna.
How far is it, ...	1 2 3	...	...	...	He is going, ..	...	...	No zheto.
Give me to eat, ...	1 2	...	...	...	I have gone, ..	...	...	Goo zherik.
Having broken the wood bring it, ...	1 2 3 4	3	2 1 3	Sheeng k,ho kura.	Thou hast gone, ..	...	...	Ka zheo.
Where is your house, ...	1 2 3 4	...	...	Kan keem a to.	He has gone, ...	1 2 3	...	No zhere.
Whose house is this, ...	1 2 3	...	...	No oongoo keem to.	Give to him, ...	1 2 3	...	No ra k,het.
Where are you going, ...	1 2 3	...	...	Ka a zatun.	Give to me, ...	1 2 3	...	Ungra k,he.
					Take it from him. ..	...	...	Noo da t,hao.

The above languages, are spoken at the following places, Milchan in Utharabees, half of Pundrabees, Rasgramee, Wangpo, Tookpa, Yooshooung, Rarung, and part of Gungel. Theburskud in Soongnum and She aspa.

Zhungram in Zhungram, with the exception of Rarung village. Soomchoo in Soomchoo.

B,hoteea or Tartar, in Hungrung and the Tartar villages of Tookpa; this language, with a few slight variations, prevails at Garoo, Mansurmur, and along the banks of the Brahmapootra to Teshoo Loomboo and Lahassa, it is the native tongue of Ludak, to the Northwest of which country it becomes intermixed with the Toorkee or Turkish, which is spoken in Yarkund. Dr. Gilchrist's Orthography has been used.

*Note on the Passes into Hindoostan from the West and North-west, and the use made of them by different Conquerors.*

The following Note was prepared for official use and reference, rather than for the prosecution of literary and scientific researches; the interest attaching to the subject at this juncture, will excuse its publication in this shape, without that full citation of authorities and elaborate comparison of statements, which in a more formal Essay might be expected, and for the complete satisfaction of the learned on controverted points would be indispensable.—H. T. P.

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The river Indus has always been regarded as the natural boundary of India, but its valley is within that country; the real boundary is the range of mountains that shuts in the elevated plains and arid deserts of Afghanistan.

The Indus, after a course of near 500 miles to the north-west, washing the northern foot of the Himalaya, and fed by tributaries from the north and south, breaks through that chain after receiving the waters of the Gilghit valley from the N. W. The slide of one of the mountains of the pass submerged that valley about a year and a half ago, and the accumulated waters, reopening suddenly the closed passage, produced a most destructive inundation, (the rise at Atuk being no less than sixty feet,) which sent a back stream seventy miles up the Kabool river. The Government wished to have this convulsion of nature examined, and Dr. Jameson was deputed, with the assent of the Sikh government, to follow the river Indus up for the purpose; but the insurrection of the Afghan tribes defeated this intention, and we have consequently no intelligence to be depended upon of any of the passes north of Atuk, where the Kabool river flows into the Indus.\*

\* Mons. Court, an intelligent general of the Sikh army has, however, given the following list of the ferry points of the river above Attock: 1. Bazar Hound; 2. Monari; 3. Pehoor; 4. Nachhee; 5. Kabbel; 6. Chitabha; 7. Amb; 8. Durband; 9. Chuturbahi; 10. Mabera; 11. Toohara; 12. Morer; 13. Didel; 14. Kamache; 15. Buhar; 16. Pachetlehi; 17. Guendoo; 18. Mateeal; 19. Buttera; 20. Jendial and Manial; 21. Kalchi; 22. Palespatan; 23. Pohogoojee; 24. Koonchir; 25. Jalkoot. We know further that Fateh Khan Vuzeer, carried a force by Durband and Muzfurabad to relieve his brother in Kashmeer, before that valley submitted to Runjeet Singh. Mahmood of Ghuzni also went by the same route into Kashmeer, and from thence made an expedition into Kashghur. These routes, however, are only open for a few months of summer, and are not likely to be chosen by an invading force aiming at the conquest of India.



At Atuk, the Indus is considered as entering the plains of Hindoostan, but it is a mistake to consider the navigation as extending to this point from the sea. The river is a torrent for a hundred miles further to Kalabagh, where it passes through a low range, full of salt mines, that runs across from Kohât to Pinddadur Khan on the Jhilum, and in crossing the Punjab, the route from this latter place to Attock is through a hilly country. From the Indus to Kabool, the ground rises to upwards of 7,000 feet above the sea. The Hindoo Koosh is to the north, and another snowy range, called the Sofed-Koh, to the south of the valley, and the spurs from both meeting at the river, leave successive passes, and beds or basins, of which former the Khyber, from its breadth rather than height, is the most famous. The Julalabad basin is on the other side of the Khyber pass; between it and the fertile valley of Kabool, there are eight other passes, and the road leads away from the bank of the river to the south, because the passage is easier where the spurs join the higher range.

The Soofed Koh, or southern ridge of the Kabool valley, is a spur of the Hindoo Koosh, which, shooting out at a point west of Kabool, divides the sources of that river from the stream that waters Ghuzni, and thence sending one branch southward, (which extends even to the sea,) runs due east to the Indus, and terminates in the Kohât country.

This ridge is crossed about nine miles north of Ghuzni, at an elevation not much exceeding 9,000 feet from the sea, and consequently only 1,000 to 1,200 feet above the level of Kabool and Ghuzni; but it is much more elevated in the eastern branch, south of the Kabool valley, where it is called the *Soofed Koh*, white or snowy mountain, because so seen throughout the year. Close along the southern root of the Sofed Koh, is a road called the Bunghish route, communicating with both Kabool and Ghuzni. It has not yet been explored by any British officer, but was proposed to the troops at Kabool as to be followed on their retirement, in order to prevent their junction with General Sale at Julalabad, who had not submitted. The route was rejected as impassable at the season, (January,) because of the necessity it imposed of crossing the Sofed-Koh.

This route has a communication with Kohât, and with Banoo and Kala Bagh, at which latter place, or a few miles below, the river it follows joins the Indus.

Next below the Bunghish route, is that of the Gomul river from Dera Ismail Khan. This route comes in to the Ghuzni valley from the south-east, and through Zoormut, east of Ghuzni, has a communication also with Kabool.

The Gomul route was followed by the late Lieut. Broadfoot of Engineers, and we have a survey and report upon it.

Dera Deen Punah, below Leyra, is the next point of the Indus, from which there is a known route into Affghanistan. It is on the straight line from Feroozpore to Kandahar, and the pass is south of the Tukht-i-Suleeman, the highest pinnacle of the Sulimani range. It has yet been traversed by no British officer, but a route is marked in most maps as laid down from native information.\*

Next below Dera Deen Punah, is Dera Ghazee Khan, the routes from which place westward are equally unknown. This tract of country is under the government of Sawun Mul, the Sikh soobah of Mooltan, whose disposition has not been considered sufficiently friendly, to warrant either the use of its passes, or any attempts to improve our intelligence respecting them. Below Dera Ghazee Khan, the Sulimani mountains take a sharp turn westward, away from the Indus, and there is an indent of triangular shape, at the apex of which is the Bolan Pass to Quetta. The low ground is fertile and well watered under the hills, but is separated from the Indus by a sandy Desert of about ten or twelve miles breadth, in which the rivers of Dadar, Lehri, and Gundava lose themselves in the dry season before they reach the great stream. This tract is the valley of Kuchchee.

The notices to be obtained from history of the use made of these passes respectively in the different expeditions into India, are extremely scanty; the historians generally giving only the date of departure from the different capitals, and the places attacked in succession, with a detail of personal adventures and exploits in the actual fights.

Passing over the progress of Moosulman conquest through Khorasan and Transoxania to Ghuzni and kabool, we find Subuktugeen established at those two places, and contending with the Hindoo Raja of Lahore, (Jypal,) for the possession of Lughman. The Hindoo Raja

\* It has been stated, that Lieut. H. Marsh of the Cavalry, came from Kandahar to the Indus by this route, but I have never seen any notice of the line of road followed by this officer.

was the assailant, and suffering from rain, retired from Lughman upon a composition, the surrender of fifty elephants being one of the terms. The Raja, however, was not yet disposed to yield, and returned with a large army of Hindoo allies, stated to have exceeded 100,000 men. Subuktugeen defeated Jypal again in the Lughman or Julalabad valley towards the end of the tenth century of our æra, whereupon the tribes of that valley, and of the Khyber, submitted to the conqueror, and the Lahore authority ended at Peshawur.

Mahmood, the son of Subuktugeen, made twelve expeditions into India; the first ten of which were entirely directed against the Hindoos of the Punjab and Mooltan, and the tenth ended in the final establishment of Moosulman sovereignty at Lahore. Kanouj on the Ganges, and Muthra on the Jumna, were the limits of Mahmood's marches in these expeditions. His twelfth and last expedition took a different direction.

Starting from Ghuzni on the 12th October 1025, A. D., Mahmood reached Mooltan in a month and five days, and there having got together 20,000 camels, he marched across the Desert to Ajmeer, whence he turned south, and taking a place called in *Ferishta*, Nihurwala,\* and in the *Rozut-oossufa* Bhuwara, he reached Somnat on the sea-side close to Patun in Goozrat, in January 1026 A. D. The city and temple were sacked, and Mahmood remained upwards of a year in Goozrat, when his army being weakened by disease and desertions, he found a return by the route he had come impossible. He accordingly marched west to Sindh, and being overtaken by the hot season, suffered exceedingly before he reached Mooltan. In this expedition, and in another immediately following, to punish some Jats of the Mooltan district, he seems to have used the straight road from Ghuzni to Mooltan; viz. that by the Gomul, for he could not otherwise have reached the latter place in a month and five days. None of the historians, however, say by what route he did march on either occasion, the omission of any mention of Kabool, Peshawur, &c. or of other intermediate places, combined with the shortness of the time allowed for the journey; being the proof relied upon for the fact, that he came direct by the Gomul route.

Mr. Elphinstone calls this place Anhalwara.

The subsequent expeditions into India from Ghuzni, being in support of the dominion thus established at Lahore, and extended afterwards to Dehli, and even into the Dukhun, were not hostile in their traverse of the passes of Afghanistan.

The overwhelming irruption of Chungeez Khan, is therefore the next event in history to be noticed in connexion with these passes.

Chungeez Khan is said to have brought from Mongolia as many as 700,000 fighting men, and his army must have been immense, for detachments from it made expeditions, exceeding in daring and skill, every thing we read of since the march of Alexander to India. He entered by Toorkistan, where his son Joojee Khan, with an advance guard, fought with such determination the whole army of Mohummed Shah of Kharizm, as to induce that prince to yield the open plain, and betake himself to the defence of his cities and fortresses. The principal seats of this king's dominion were in Mawur-ool-Nuhur, that is, in the country between the Oxus and Jaxartes, (the Amoo and Sir rivers,) but the whole country from Ghuzni and Kabool, to the mouths of the Wolga, owed him fealty and allegiance, direct or tributary.

Chungeez Khan advanced himself to Bokhara, sending two detachments under his sons to take Otrar, the principal city on the Jaxartes on his right, and Khojund and other places in Furghana on his left. He was rejoined by them at Bokhara, after they had reduced all the places on that river, so as to secure that base for future operations. In A. D. 1219, Chungeez reduced and utterly destroyed Bokhara, Samarkund, and Bulkh, and while he proceeded against the last named place, passing by and destroying Turmuz, he detached two of his sons against the capital of Kharizm, then called Orgunj, which they reduced after a long siege of seven months. He had thus the whole line of the Oxus at command. His generals had some years before overrun the whole of Kashghur and Yarkund, and had followed up and slain the chief of the hostile tribes of that region at Sir Kool, the source of the Oxus, so that his flanks were quite secure.

From Samarkund, Chungeez had detached a strong army, stated at 80,000 horse, to follow Mohummed Shah into Persia. This detachment admitted Merv, then a place of great consideration, to a composition, and advanced to Herat. The governor, Khan Malik, submitted, and two of Chungeez Khan's generals, Zena or Juna-

noyan and Suveda Buhadur, received the submission, and turned towards Nyshapoor and Persia. The third who followed the other two was not satisfied, and insisting on the possession of the citadel, stormed the town, but failed in the assault and was killed. From Bulk, Chunggeez hearing of this disaster, despatched Toolee Khan with a large force, who reduced and established governors in both Merv and Herat, and rejoined his father during his siege of Talikan. Julal-ood-deen, son of Mohummed Shah, had by this time retired to Ghuzni, and, uniting in his cause all the Afghan tribes, promised to make head against the Tartars in the difficult field of Afghanistan. Chunggeez marched against him from Bulk by the road of Talikan, which place cost him a siege of seven months. Seeing the importance of cutting off the Afghans from Persia, where Mohummed Shah also threatened again to make head, Chunggeez sent a second detachment of 30,000 horse from Talikan to Herat under three new generals. These advanced from Herat to a place called Sagil, by Abool Ghazee Khan, and supposed to be Kandahar, but I rather incline to think it may be Sakhir, the capital of the Ghor country, then a city of great consideration, or if not Sakhir,\* some place on the Helmund, for a river is specifically mentioned. Julal-ood-deen advanced with all the troops of Afghanistan, and giving battle to Chunggeez Khan's generals while engaged in this siege, defeated them with great loss and relieved the place. The Afghan chiefs, however, quarrelled about the booty, and one gave the other a box on the ear,† which led to two principal chiefs deserting from Julal-ood-deen's army, one of whom retired to Kurman in Persia, while the other, Khan Malik, went back to Herat. In the mean time, Chunggeez Khan had taken Talikan, and advanced to Inderab, which detained him another month, and it was here that he heard of Julal-ood-deen's victory. He immediately advanced by Bameean to Kabool, but lost a favorite grandson, (son of Oghtae Khan,) at the siege of the former place. Coming suddenly upon Ghuzni, it was yielded to him, and he learned that Julal-ood-deen had made for the Indus river only fifteen days before

\* The Rozut-oo-sufa calls the place Valiban, and says it was on the river Baran. This book is a compilation of high authority made by Ameer Alee Khan, between the years 1444 and 1496 A. D.

† The Rozut-oo-sufa says, a blow of a whip.

he arrived. Thither he was followed by Chungeez with such expedition, as to be overtaken and defeated before he could effect a passage. Julal-ood-deen swam across the river with only one or two attendants in sight of the conqueror, whose admiration was much excited by the feat. The site of this battle, which was the limit of Chungeez Khan's irruption in that direction, is not known, nor the routes by which he and his enemy marched for the river, but they must evidently have been in the line east or south-east of Ghuzni; and the Gomul pass was therefore most probably that followed by Chungeez, while Julal-ood-deen went either by the same, or by that which debouches upon Dera Deen Punah.

For the punishment of Herat, Chungeez now sent a third force of 80,000 horse, which taking the place after an assault of six days, left only sixteen persons alive of the entire population. Chungeez returned northward by Bulkh after his victory on the Indus, but was compelled to send back Oghtae Khan, his fourth son, to quell an insurrection at Ghuzni, and to destroy that city also, which had been saved hitherto, because it had submitted upon capitulation. All these operations were completed in four years, between 1219 and 1222 A. D. inclusive, and this wonderful conqueror returned in the last of these years, in order to complete the conquest of China, which he had effected only as far as the great Yellow River before he entered Kharizm. He died, leaving the remainder to be achieved by his grandson. He was met on his way back by his generals, Juna Noyan and Suveda, who from Herat entered Persia by Nyshapoor, and destroying Toos, Humadan, and all the cities that resisted in the north of Persia as far as Kurdistan, turned round thence by the west of the Caspian, and forcing the Durbund Pass, made good their march to the Wolga, and thence across the Kipchak Desert to Khiva and Kharizm, where Toolee Khan, a son of Chungeez, was firmly established as ruler. As long as history lasts, the astonishment of the world will rest on these achievements, imperfectly as the particulars are known.

We come now to the no less wonderful expeditions of Ameer Tymoor, commonly called in Europe Tamerlane, or Tymoorlung. This conqueror was originally a petty chief of Mawuroonnuhur, but raised himself by the daring and active part he took in the troubles which in his youth distracted that region. Toghluk Tymoor, of the Chungeez

family, was induced by these troubles to invade the country from Kashghur. After a spirited defence, Tymoor and Ameer Hoosein, who were then friends and associates, were driven into Kharizm, but on the retirement of Toghluk, they returned and drove out his son Khoja Ilias. Shortly after the two friends quarrelling, Tymoor defeated and slew Ameer Hoosein, and so became sole master of all the country between the Oxus and Jaxartes. He now made successive inroads into Persia, Russia, (wherein he penetrated to the White Sea, in a latitude at which the sun never sets,) Mongolia, Georgia, and Baghdad. After thirty years of ravage in all directions, he determined on the invasion of Hindoostan, being then upwards of fifty-five years of age. His chiefs at first were averse to this expedition, on the ground, as Tymoor himself quaintly writes in his memoirs, that their race would be lost, and their children would speak Hindee, but he reconciled them to it, and having got possession of Herat and Kabool by a mixture of "*nurmees and gurmee*," mildness and severity, he sent his grandson, Peer Mohummed, eastward from Herat, to prepare the way for an advance to the Indus.

In A. D. 1398, the lower passes of the Sulimani range being forced, Peer Mohummed crossed the Indus, a little below Dera Ghazee Khan, and thence advanced to the siege of Mooltan. In this operation he was occupied six months, during which the rainy season came on, and he suffered very severely, losing most of his horses.

Tymoor himself came by the road of Kabool, and was employed in punishing the Seeah Posh Kafirs of Kohistan, north-east of Kabool, while Peer Mohummed was in the Sulimanees range, as above stated. He followed the tribes on foot, as well from Budukhshan as from the Kabool side, into places quite impassable for cavalry, carrying two horses only for his own use, one of which was killed while being slidden down a glacier in a wooden case stuffed with cotton. Returning after this campaign to Samarkund for fresh troops, Tymoor reappeared at Cabool, and from thence took the Bunghish route by Ayrab, ایراب or Haroob, of which place and Ghuzni, he got possession by treachery. From Ayrab he sent his son Meerza Khuleel to Banoo by the route called in the *Rozut-ool-sufa* Kubjughai, (perhaps Koochi,) while he made an excursion himself against a hostile tribe of Afghans, called Burniani or Purniani. He left their capital on the first of Mohur-

rum 801, Hijree, (13th September 1398, A. D.) and came out on the Indus at a fort previously built as a dépôt at Nufur.\* Thence marching rapidly down the Indus to the point where Julal-ood-deen swam across after his defeat, (it is specifically so stated in the *Rozut-ool-sufa*, the best historical authority,) he built a bridge across the river in two days and crossed on the 12th Mohurram, that is in twelve days only from the time of his receiving the submission of the Burniani tribe.

After crossing, Tymoor made directly for the place of confluence of the Jihlum and Chinab, and there reduced a chief, whose capital is described as an island at this point strongly fortified, while he sent a reinforcement to his grandson at Mooltan, and ordered him to join him at Dybalpoor, which lies towards the Sutlej.

Tymoor reducing Talumba, crossed the desert from that place to the old bed of the Beas on the 1st of Suffur of the same year, 13th October 1398, A. D., and on the 7th, captured Gokree or Gourkee: then reducing Ajudia, which yielded and was respected, he effected a junction with his grandson at Dybalpoor, and then prepared to cross the Sutlej, and march on Bhutner in the Desert, where he learned that the Hindoos had collected as in a place of security.

Bhutner is at least sixty, some say ninety miles from the nearest point of the Sutlej, with a waterless Desert for the whole distance. Tymoor, however, made the march in one night with the bulk of his cavalry, surprising there a large store of cattle and supplies that had been collected in full reliance upon the impassability of the Desert.

After massacring the whole population of Bhutner, Tymoor went by Sumana to Delhi, which he sacked. Thence he crossed to the Ganges, and entering the Sewalik or lower range at Hurdwar, carried his army back through the mountains to Jummoo and Kashmeer, and thence to Kabool by the Khyber Pass; thus safely reconveying his enormous booty to Samarkund, where he rested only sufficiently long to prepare for his great expedition westward against Ildrim Bayuzeed.

The invasions of Babir and Nadir Shah present no peculiarities in the routes taken. Babir was established as Sooltan of Kabool for

\* This may be Bukur or Nuker. There is a place of the former name at this part of the Indus, but it is on the wrong side of the river.



more than twenty years before he made any attempt on India, and then he was invited by the rebellious chief of Lahore, who aided in his first advance to Delhi. He always used the same direct route, and early established a garrison and depôt at Sirhind, in aid of his expeditions. Nadir Shah having established his authority in Persia, took Herat after an eight months' siege, and thence advanced to Kandahar, claiming these as cities of Persia. From Kandahar he advanced by Ghuzni to Kabool, having conciliated the Ghiljie tribes, who had cause of offence against Delhi for neglect in the payment of certain customary stipends. In his march from Kabool, he was unopposed, until he crossed the Sutlej, owing to the distractions and intrigues which then rent the court of Delhi. The battle which opened the way to Delhi was fought at Kurnal, and Mohummud Shah thence carried Nadir Shah to his capital as a friend or ally. The invader returned across the Punjab unopposed as he had come, with the plunder of the palace and capital of the Moghul emperor in his train.

Ahmed Shah, in all his expeditions, seems to have followed the same route, preferring it apparently on account of the water and forage which is always to be obtained in plenty at the foot of mountain ranges of sufficient elevation, and having garrisons of his own, or of friendly chiefs at Atuk, Lahore, and Sirhind. The march of Nadir Shah is thus the last that can be called an invasion for purposes of conquest.

This notice, however, of the routes and passes into India that have been followed by different conquerors would obviously be incomplete, if the wonderful expedition of Alexander were altogether omitted. It has been reserved for last mention, that the reader may have the benefit of the story of after-expeditions, to assist in the determination of the line of this earliest—the Greek historians having left its course and details somewhat obscure.

The compilation of Arrian is the record of best authority which we possess of the military operations and marches of Alexander; for Quintus Curtius supplies only some fuller details of personal adventures, and a very few additional names. Arrian's seven chapters on Alexander's Expedition are based, as the author states, on the notes of Ptolemy and Aristobulus, who both accompanied the army throughout. His descriptions are sufficiently accurate to enable us, with the lights recently

thrown upon the geography of the countries traversed, to identify most of the principal rivers and places named; but there is a sad want of dates and distances in Arrian's narrative, and even the seasons of many of the operations, and the number of months and years occupied in them, have to be guessed from circumstances. On the whole, however, Arrian is a more sure guide in regard to this expedition than any other author of antiquity, and but for the changes of names usual in the Greek version of oriental appellatives, as well as those incident to the course of events in twenty centuries, there would be less difficulty in following him than the Persian and Turkish historians of later expeditions.

After the victory of Gaugamela, in the province of Arbela,\* which was gained in October 331, B. C.,† Alexander marched first to Babylon, and then to Susa and Persepolis. The ruins of both Persian capitals have been fully traced and explored, the former is near Shoostur, and the latter about 100 miles north-east of Shiraz. These royal cities Alexander sacked, and then collecting all the camels and beasts of burthen of Lower Persia, he followed Darius to Isfahan, (Ecbatana,‡ the capital of Media, at the time of this expedition. Hearing however of Darius's flight towards Bactria, he took himself with a light division the eastern route by Yezd to Tabas, said to be the last town of the Parætaceni, (half way between Yezd and Mushud.) Finding there that he could not overtake the fugitive king before he passed the

\* Arbela appears to have been a city, the head-quarter town of a district.

† Arrian gives three dates, one of this battle, a second of the death of Darius, and the third of the battle with Porus. This last however is erroneous.

‡ There is a great controversy amongst the learned as to whether Hamadan or Isfahan is the Ecbatana, capital of Media, through which Darius fled, and at which Alexander made his arrangements for the Bactrian campaign. I think it not at all improbable that both bore the name, but if the resources of Darius lay in Bactria, it is very unlikely that he and Bessus should have retired by Hamadan, and the evident line of advance from Persepolis, which is near Sheeraz, was Isfahan. The Parætaceni also lay to the right, and the site of Tabas half-way between Yezd and Mushud, would show, if we assume the flight of Darius and pursuit of Alexander to have taken this direction, that the latter attempted by that route to cut off Darius from Bactria, while his main army advanced by Isfahan. Tabas is named by Quintus Curtius as the limit of Alexander's pursuit towards Bactria prior to the reorganization of the army at Ecbatana, but by a strange confusion he places the death of Darius in this flight from Ecbatana, whereas it clearly did not occur till next season. The pursuit from Hyrcania and the Elburz mountains may, however, have taken a south-westerly direction to Tabas, so as to be that referred to by Quintus Curtius, which would leave doubtful the previous march on the same place.

mountains, Alexander returned to Ecbatana, (Isfahan,) and there rejoining his main army, employed the winter in reorganizing his troops, and dismissing homeward those Greeks whose time of service was expired. This effected, early in the spring of 330, B. C. Alexander crossed the Elburz mountains\* at the pass near Tehran, called that of Dumavund, and formed his army in two divisions, employing one of them in reducing the Mardi, a poor and semi-barbarous race, who occupied a tract of country between the Elboorz range and the Caspian, while the other was destined to operate northward up the eastern shore of the Caspian against Hyrcania. With this latter went Alexander, his reason for reducing this wild country being that a body of Greek mercenaries had retired thither. Hearing, however, while his army was crossing the Elburz, that Darius was in force at no great distance, he countermarched and formed a light division with which he went in person to attack him.

The Persian king, assisted by Bessus and the chiefs of Bactria and Darangia, (Seestan) had appeared with an army towards Mushhud,† but refused to abide another battle, and fled as the Greek force approached. In this flight Darius was first deposed and made prisoner, and then slain, and Bessus assuming the royal title, fled towards Bulk in Bactria. This was in the month of July 330 B. C. and, if Quintus Curtius is right in naming Tabas as the place of the assassination, the flight must have taken a southerly direction from near Mushhud

\* The pass is called in Arrian, the Caspian gates, and Ragæa is placed near it, D'Anville's map of the ancient world gives precisely the locality of Dumavund for this pass. Darius's flight cannot have taken the line of the west shore of the Caspian, so as to pass the Durband Caspian gates.

† There is much confusion in this part of Arrian's narrative. He mentions the reorganization of the army and many arrangements made at Ecbatana, but leaves it to be supposed that these were operations of a day or two, and that the pursuit of Darius to Ragæ and the Caspian gates was immediately taken up. But there is a winter intervening between Alexander's march to Ecbatana and the campaign, in the course of which Darius was deposed and assassinated: this season therefore was evidently devoted to the reorganization of the army, and if Alexander did follow Darius to Ragæ in 331 B. C., it was a mere excursion at the end of the season, not a continuance or renewal of the campaign. Dr. Thirlwall has been misled by not allowing for a winter here. He supposes that season to have been occupied in the operations near Persepolis. The date given by Arrian for Darius's death, compared with that of the battle of Arbela, and the stated military, and civil arrangements made at Ecbatana, prove the manner of the campaign.

or Abbasabad, which, as the Seestan Satrap was the ally of Bessus, is not impossible. Alexander returned, according to Arrian, with the body of Darius, and crossing the Elburz range to the river Atruk, finished the conquest of Mardia and Hyrcania, (Mazenderan and Gheelan.) This effected, he took the direct route to the country of the Arii. The capital of Aria at that time is called by Arrian Susia, probably the Hellenism of Subza or Subzawar,\* Herat was not in existence, but is supposed to be on the site of the city or fort erected by Alexander afterwards to control the Arians. Alexander established a Persian governor at Susia, and returned northwards to pass into Bactria after Bessus, by the routes probably of Merv or Mymuna. The Grecian king, however, had no sooner turned his back on the Arian country, than the Persian governor revolted, and having overpowered the detachment left with him in Subzawar, retired to make head at Artakaona amongst the mountains east of Herat. This brought the Grecian army back in haste. Artakaona† is a place written six ways, but which probably will be the Greek version of Oordoo Khan, a common name. Sakhir, the capital of the Ghorians at the head of the Kashk river, is a site well suited for a stronghold of refuge, and the Oordoo Khan or Artakhan intended, will probably have been near it.

Alexander followed thither with a light force, making a rapid march of 600 stadia in two days, while the bulk of his army returned southward more leisurely, and moved down to the Pontus, or inland sea, into which the Helmund discharges itself. Artakhan was evacuated on his approach, whereupon Alexander turned southward also, and the Persian governor of the southern districts, called Zarangai or Drangæ, (Seestan,) having fled eastward to the Indus, Alexander returned again into the mountains and remained some time there, while he built the fort before-mentioned on the site of Herat to check the Arrians. Here he received the submission of the tribes of the southern

\* Dr. Thirlwall supposes this Susia to be Toos, the ruins of which have been traced about seventeen miles NNW. of Mushhud, but Toos would be in Parthia, and not in Aria, as thus situated

† All the Persian poems and traditions mention *Astakhar*, as the place whence Alexander marched towards India, but the Astakhar of the *Shahnama* is the capital of Persia. The great Roostum was a native of Seestan.

districts as far as Kandahar in Arachotia,\* but it does not appear that he went thither; on the contrary at a late period of the year 330, B. C. he made the passage over the high ridges between Herat and the Kabool valley, suffering much from cold on the march, and then at the junction of the Punjshuhur and Koh-damun rivers, in the plain of Beghram, near Charikar, he founded the city of Alexandria *apud Caucasum*, about which there has been so much dispute. Its identity with the Beghram ruins has been established in a late† essay of Major Rawlinson, now at Kandahar, and the whole story of Arrian confirms the site. Here Alexander wintered, and at the first opening of spring in the following year, 329 B. C., crossed the Hindoo Koosh to attack Bessus. I consider it most probable that the passage was made from Charikar by the Gorebund or Purwandura Passes, for Drapsacus, which was attacked immediately after the traverse, was evidently the present Indrab, the fortress which gave so much trouble to Chungeez Khan.

The immediate effect of this line of operation was to drive Bessus out of the whole country between the Oxus and Hindoo Koosh, and to

\* Arrian is cited as authority for Alexander's having marched by Kandahar to Kabool, and by Bamian to Bulk, but Arrian only says the Arachotians submitted, not that Alexander ever went into their country. His words are *Ταυτα δε διαπραξαμενος προηει ως επι Βακτρα τε και Βησσον, Δραγγας τε και Δραγωγους εν τη παροδῳ παρασησαμενος. Παρεσησατο δε και τους Αραχωτους και σατραπην κατεσησεν επ' αυτοις Μενωνα. Επηλθε δε και των Ινδων τους προσχωρους Αραχωτοις. Ξυμπαντα δε ταυτα εθνη δια χιονος δε πολλης, και ξυν απορια &c.*

"Having finished these things, he set off for Bactria and Bessus, in the route having established his authority over the Drangæ and Dragogi; he also established his authority over the Arachoti, and appointed Menon their Satrap. He came then into the country of the Indians, bordering on that of the Arachoti, and all these nations he reached through much snow, and in great want of necessary supplies, and with much suffering to the troops." This shews he passed through the Huzara country north of the open plains of Seestan and Kandahar, for in crossing them to the Kabool valley even in October, his army would suffer from extreme cold. He crossed apparently by the route, and in the season, when Babur suffered so much on his return from Herat to Kabool. If the march was made in the season when there is snow at Kandahar, and by that route, the passage to Ghuzni, and especially over the mountains between Ghuzni and Kabool, must have been quite closed.

† I much regret never having met with this essay, and doubt not that it would have thrown light on many points which are still obscure.

cut him off from retreat into Kashghur. He had fomented another insurrection at Herat, and sent 2,000 horse to support it, while Alexander was making the Huzara passage, prior to wintering in the Kabool valley; but this was defeated by the garrison left in the new city, aided by a detachment sent back, without requiring Alexander's presence. Bessus therefore on the passage of the Hindoo Koosh being effected, retired at once to the mountains of Sogdiana, Nautaka, supposed to be Karshee or Nukhshab, being the position he took up to watch the further course of events. Alexander took Bulkh and all the country south of the Oxus, and established six stations according to Quintus Curtius to guard and command the passes of the mountains. He then crossed the Oxus on skins, at a point where the river was rapid and deep, and had a sandy bottom, which is the character of all the fords about Bulkh. Bessus was betrayed and given up before Alexander reached his position at Karshee, and thereupon Alexander followed up his success by seizing Markanda, (Samarkund), and he thence continued his march, meeting with no serious opposition, to the Sir or Jaxartes, called by Arrian the Eastern Tanais. He crossed this river to punish the Scythian cavalry, who had inflicted on him some loss as they retired before him through Sogdiana. Alexander fought on the other side of the Sir a sharp cavalry action, in which he was wounded severely by an arrow in the leg, his fibula or smaller leg bone being broken. He gained the victory, however, and dislodged the enemy from a mountain supposed to be that opposite to Khojund, with a loss stated at 20,000 men.

Alexander remained sometime on the Jaxartes, and commenced building a city or fort near Khojund. He at the same time summoned all the tribes to a general convention to be held at Zariaspe, (Huzarasp on the Oxus,) in the coming winter; but while he was so occupied in advance, the nomade tribes of the Kizil-koom desert and Lower Jaxartes, rose on the garrisons he had left in his rear, and under Spitamenes, an active and energetic partisan, besieged Markanda. Alexander on the first news of the insurrection retraced his steps towards Markanda, reducing all the cities on his way without difficulty until he came to Cyropolis, which is probably Kesh, or Shuhur Subz, where Persian tradition fixes the birth of the great Cyrus. This siege proved difficult, for the city is described as large and

populous, the walls strong and high, and the inhabitants warlike. He mastered it at length, effecting an entrance by the river bed, during a season of drought, and then returned to secure his posts on the Jaxartes, sending a division to strengthen Markanda. While he was encamped on the banks of this river, seeking to inspire the Scythians with a dread of his power, the division of his army sent for the relief of Markanda, was defeated and utterly destroyed on the banks of the Zura<sup>f</sup>shan\* river by Spitamenes. This called Alexander back to Samarkund, and after ravaging the valley of the Zura<sup>f</sup>shan, he moved to Huzarasp, where he had proposed to winter, in order to hold the convention before proclaimed, and to confirm by policy, the influence his victories had established. It was here that Clitus was slain, and that Scythians from the western Tanais (the Wolga or Don) came, and endeavoured to persuade Alexander to attempt the passage that way back to Europe; but Alexander excused himself, saying, he must first conquer India, and then would come by the route of Europe round that way to the Tanais and Huzarasp.†

Early in the spring of 328, B. C. while the snow was still on the ground, Alexander took the field again, for reduction of the cities of Sogdiana, which still held for Spitamenes. His army marched in five divisions, Alexander heading that which took the mountain road by Samarkund. Soon after the march, Huzarasp was attempted by surprise, but saved by its garrison. Spitamenes then made a gallant attack on the left division led by Cœnus, which skirted the desert, and had marched apparently for relief of the garrisons of the Jaxartes: it was met by Spitamenes while countermarching for the defence of Huzarasp, consequently on the attack of that post. Being defeated by

\* Arrian calls the river of Markanda, Polytimetus, the much-valued, Zura<sup>f</sup>shan is gold scattering. The description of its losing itself in the sands of the Bokhara Desert confirms the identity, if the name and other circumstances had left any doubt on the subject.

† The site of Huzarasp, no less than the similarity of name, proves it to be the Zariaspe referred to. It is on the Oxus in the advanced position suited to the convocation, and is exactly the place the Scythians of the Steppes towards the Wolga might be expected to come to, while the river being navigable gave all the desired facilities for forming a depôt. The next year's march back to Samarkund establishes the correctness of this position, and it is further confirmed by the communications held at it with the Chorasmeni, (Kharizmees.) Kheeva and Orgunj, the capitals of Kharizm, being only a few marches down the stream of the Oxus. The limits of ancient Bactria might well extend down the Oxus as far as Huzarasp.

Cœnus, Spitamenes was deserted by his followers, who hearing that Alexander himself also was approaching, cut off their chief's head, and sent it as an atonement for their own transgressions.

Being thus rid of this active enemy, Alexander had leisure to reduce the mountain forts of Soghdiana, lying between the sources of the Jaxartes and the Desert west of Samarkund ; and the season being occupied in establishing posts and settling this country, he wintered again north of the Oxus at Karshee, and there received reports from all the Governors and Satraps he had left in the conquered territories.

In the spring of 327, B. C., while the snow was yet heavy on the ground, Alexander commenced his march through the mountains towards Bulkh, reducing the places that refused to submit. He was in this march much distressed for provisions, but every fort had its depôt, and the store of one of these, held by a chief named Chorienes, furnished a two months' supply to the whole army at a time when it was in great want. As the spring advanced, Alexander taking the route of Bulkh, approached the Hindoo Koosh again, and crossed it to the city he had built in the plain of Beghram. There he was met by Taxiles, an Indian chief, whose capital (Taxila) was across the Indus. This chief urged an advance in that direction, with the design of bringing to subjection a rival chief of Peucilaotis, supposed to be in the country near Peshawur. Alexander sent with this Indian chief Hephæstion, and the bulk of his army, marching them by the route of the Cophenes river. Under the Raja's guidance, Hephæstion passed without obstruction downwards, apparently by the Khyber, and having captured Peucilaotis, set himself with the aid of Taxiles, to build a bridge at Attuk. Alexander himself was determined to reduce the mountainous tract of country lying between the Cophenes and the Hindoo Koosh, and the number of rivers passed, and description of each given by Arrian, correspond exactly with what we now know to be in existence in that tract, though the names of several places and of races of people differ as might be expected.

Alexander from Beghram passed down the Punj-shushur river, and crossed the Tagao with difficulty, then reducing two cities, the second called Andaka, he came to the river Euaspla, (Alishung), where the Aspî were in arms. The enemy fled to the mountains, and Alexander followed to their stronghold, finding the capital which Arrian calls



Arigæum, deserted and in ruins. There was a very severe battle fought here, which ended in the complete defeat of the natives, and the capture of 230,000 head of cattle, remarked as of very fine breed. Thence Alexander marched against the Assaceni, passing through the territory of the Guræi, (Lughman,) and crossing the river of that name (now the Koner or Kama,) which Arrian states as rapid, and difficult of passage, because of the large round slippery stones in its bed. On the eastern banks of the Koner river, was the city of Massaga, somewhere near Pooshoot, which was captured with great difficulty; and some mercenaries of the garrison, stated to have been of Indian race, were incorporated with the Grecian army.

From Massaga, Alexander marched to Bazira, without crossing another river, shewing evidently, that Bazira must be the present Bajaor. He expected it to be surrendered without a siege, but was disappointed, and hearing that relief was coming from Ora, which is probably the present Punjkora, he marched with his main army first against that place, leaving a detachment before Bazira to watch it. Ora being reduced, the inhabitants of Bazira evacuated the city, and took refuge in the difficult post of mount Aornus, under which lay Embolima, which Alexander occupied. This mountain will probably be that to the south of Bajaor, and between it and the Kabool river. The dislodgement of the enemy proved a matter of extreme difficulty, because of the steep ascent of the mountain. Ptolemy, however, with some light troops effected and made good a lodgment on the ridge, aided by an attack from which, the rock was at last stormed and carried.

After this, Alexander marched north to Dyrta, (which is evidently the present Dhyr,) because he heard that the king of the Assaceni was making head in the upper part of the valley of the Koner, that is, in Chitral and Little Kashghur. From hence he crossed to the Indus by a route, which required the labour of his whole army to render at all passable. He arrived on the bank of that river at a place where there was a forest, from which he cut timber to make rafts and boats, with which he floated down to Attuk, where the bridge of boats had already been built for him by Hephæstion and Taxiles. In the country between the Kophenes and Indus, Nysa, the city of Bacchus, is said to be situated, from whence Alexander received a deputation. Its site

has not been ascertained, though, as ivy grew there, it must have been high in the mountains.

Crossing the Indus by this bridge, Alexander went with Taxiles to Taxila, the capital of the latter, which probably was near the present Tatta, about one march from the river. Thence he prosecuted his march to the Hydaspes, now the Jihlum, on the other side of which Porus was encamped with a large Indian army. To aid the passage, Alexander sent back to the Indus for some of the boats or rafts he had built, and causing them to be brought over by land, amused Porus for some days by marching up and down with great parade, as if he was about immediately to force a passage.

Arrian tells us this occurred in the rains when the river was much swollen, and that Alexander was thinking of waiting for the cold season when the waters would subside. After some days, however, finding a favorable rock to conceal his preparations, he launched his boats and effected a passage at a place where there were several alluvial islands. Porus was then defeated and made prisoner. Arrian specifically tells us, that this battle was fought in the month Munychion, which is the last but two of the Greek year, beginning in July. April and May would therefore be the time of the year indicated, but this is not reconcilable with the fact of the rains having set in to swell the stream. The date assigned by Dr. Vincent and all later commentators, is August 327, B. C. which, supposing Alexander to have crossed the Hindoo Koosh on the first opening of the passage at the end of March, or in the beginning of April, gives evidence of a celerity of movement, and rapidity of conquest to excite our wonder.

After the defeat of Porus, Alexander captured Sangala on the Hydraotes, supposed to be near Lahore, and then marched to the Sulej at a spot below its junction with the Hyphasis (Beas) where historians say, he built pillars or altars to mark the limit of his conquests. Apollonius Tyaneus is made by Philostratus to say, that he saw them in the first century of the Christian æra, and that a king, Phraotes, of Greek race, and who conversed freely with him in Greek, was then reigning in the Punjab, and master of the country as far west as the Kabool valley. These altars however, though sought for with much avidity, have never yet been found by modern travellers. The remonstrances of the Macedonian troops, and their refusal to march further, created the in-

mediate necessity for Alexander's return. But preparation had antecedently been made for it by arrangements to construct a large fleet of boats on the Hydaspes or Jihlum. These were completed by the end of the rains of 327 B. C., and Alexander then commenced a march down the Punjab and banks of the Indus, in the hope of finding a ready way back to Persia by land or sea from its mouths.

On the way down, he was troubled by the spirited resistance of the Malli and Oxydracæ, the former supposed to be settled near Mooltan, and the latter a race occupying Kuchchee. In the operations against these, Alexander received a wound with an arrow in the right breast, which very nearly proved mortal, and much alarmed his faithful troops. He recovered, however, and having reduced the Sindians, made the following arrangements at Pattala, now Tatta, for return. Craterus he sent by Kuchchee and the Bolan Pass with the bulk of his army, and the heavy baggage. Nearchus with the fleet was to skirt the coast, and so make for the Persian Gulf. Alexander himself with a lightly equipped force took the route through Beloochistan, intending to keep in communication with the fleet.

This march proved the most disastrous operation in which Alexander had yet engaged; from first to last, he suffered extremely from heat, and from the want of fresh water, and the distress his army encountered is represented as almost beyond endurance, and the mortality in consequence was very great.

Dr. Vincent states, the march down from Nicæa on the Jihlum, where the battle with Porus was fought, to Pattala or Tatta, at the head of the Indus Delta, to have occupied nine months; if it was commenced, therefore, in October 327, it will have been July 326, B. C. before he reached that city: and so far Arrian bears out this date, for he says the Etesian winds, that is the monsoon, prevented the voyage by sea at the time of Alexander being in Sindh. Having made arrangements for establishing depôts near the sea-coast, and for digging wells to supply the fleet and his own army with fresh water at the first stages along the coast, Alexander set off on his march of return in September 326, B. C., directing Nearchus to follow as soon as the season was favorable. The circumstances of this voyage have been so accurately developed by Dr. Vincent, that it is only necessary to refer to them very shortly. Nearchus left the Indus a month

after Alexander, but some time still before the monsoon had properly changed: he was in consequence compelled to make for the coast and disembark, and so consumed all his provisions by the time he reached the country of the Oritæ in Mekran. Here, however, Alexander had left a depôt under Leonatus, prior to striking off from the coast to skirt the arid desert of Gedroos. From the borders of the Oritæ to the capital of Gedroos, called by Arrian "Pura," Alexander's march was one of sixty days, with always a very scanty supply of water, and that generally brackish. Pura is probably the Bunpoor of modern maps, which is in the same longitude with the Hamoon, or sea in which the Helmund terminates. Here Alexander remained some time to refresh, and receiving a convoy from Lower Persia, renewed his march through Karmania, (Kurman,) meeting every where, as he approached the limits of civilization, both welcome and abundance. Either at or near Kurman he met Craterus, who had safely brought back the heavy baggage and bulk of the army by the Bolan Pass and by Kandahar, but by what route from Seistan, is nowhere mentioned.

The expedition ended by Alexander's return to Persepolis or Pasargada, near Shiraz, with a light division, while he sent Hephæstion to skirt the coast and relieve Nearchus. The united army of Alexander reached Susa about the end of February 325 B. C., just five years from the period of its march from Ecbatana in pursuit of Darius, and five and a half from the date of the victory of Gaugamela or Arbela.

It is difficult to account for the apparent facility with which Alexander carried his large armies over tracts now deemed impassable for more than caravans. We must allow something for the habit of dealing as slaves with the entire population of a city or province reduced after resistance in arms. This gave means of transport over mountains, such as are not commanded in the strategic operations of the present day. But, after making every allowance for the free command and use of the persons and properties of the entire population subdued, the traverses of the deserts would not have been possible, if in those days they had been in the same condition as they are at present found. Their existence is identified, but their dimensions were then probably much smaller, for it is consistent with the experience of modern philosophy, that sandy deserts progressively increase in size, as well through the car-

lier soakage of the waters, which give fertility to their borders, as by the effect of wind in carrying and depositing sand, and so producing barrenness over tracts which before owned a fertile soil. With every allowance, however, for a more favorable condition of the countries traversed than they now exhibit, we shall yet find in the marches of Alexander a celerity of movement, and a promptitude of resource in difficulties of all kinds, of which it is much to be regretted, that his historians have not given more full details for instruction at this day.

H. T. P.

*Proceedings of the Asiatic Society.*

(Friday Evening, 10th June, 1842.)

The Honourable H. T. PRINSEP, Esq. President, in the Chair.

G. C. CHEAP, Esq. proposed at the last Meeting, was ballotted for and duly elected a Member of the Society.

Ordered—That the usual communication of his election be made to Mr. CHEAP, and that he be furnished with the rules of the Society for his guidance.

*Library.*

The following Books were presented :—

*Books received for the Library of the Asiatic Society for the Meeting on the 10th June, 1842.*

The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science. 3rd series, vol. xix. No. 127, and vol. xx. No. 128.

List of the Members of the Royal Asiatic Society of Great Britain and Ireland. 1841, pamph.

Lassen, Zeitschrift für die Kunde des Morgenlandes. Bd. iv. Heft. 1.

The Calcutta Literary Gleaner June, 1842. Vol. 1st, No. 4, two copies.

The Calcutta Christian Observer. New series, vol. iii. No. 30, June 1842, pamph.

Journal des Savants. Paris, Octobre 1841.

Transactions of the Zoological Society of London, 1841. Vol. ii. Part 5th.

Proceedings of the Zoological Society of London, 1840. Part 8th.

The Annals and Magazine of Natural History. Jan. 1842, No. 52, vol. xiii. pamph.

Yarrell's History of British Birds. London, 1841. Vol. iii. Part 28th, pamph.

Macpherson's Report upon the Khonds of the Districts of Ganjam and Cuttack. Calcutta, 1842.

Report on the Settlement of the District of Seharanpore, compiled by E. Thornton. October 1840.

Lardner's Cabinet Cyclopædia, Natural Philosophy, London, 1841. Vol. 1st.

Wilson's Introduction to the Grammar of the Sanscrit Language. London, 1841, 1 vol.

Bulletin de la Société de Géographie. 3rd Série. Paris, 1841, Tome xv.

Read the following report submitted by the Librarian, respecting the arrangement of Antiquities in the Museum:—

To H. TORRENS, Esq.

*Secretary, Asiatic Society.*

SIR,

I beg to submit to the Society the following report respecting the arrangement of the antiquities.

During the last three months I have had charge of this department of the Museum, and it has been my constant endeavour to identify the specimens, and place the collections in order.

The accompanying list which is to form the first part of the Catalogue, contains the arrangement and description of the antiquities and idols in metal and wood, and of the smaller ones in stone.

However, as little had been done to preserve the identity of the antiquities, no regular register kept, specifying the particulars, and giving a detailed description of the respective donations, in order to enable the Society to judge on the correctness of the catalogue, I hope, they will excuse me, if I trouble them with a statement of the reasons, which guided me respecting the identifying of the specimens.

I. Nos. 1—5. Five Egyptian idols, four of wood, and one of porcelain, presented by Lieut. Young, December, 1837, ascertained by the name of the donor, being written upon them.

Nos. 6—15. As. Res. Vol. *XIV*. Appd. p. 3. is mentioned a small collection of metal and porcelain images, presented by Capt. Bidwell, and as there is no other collection of this kind, we must suppose this to be the same that is mentioned in the Researches.

II. No. 16. A copper figure dug up near Bushire, donor Capt. J. Hennel, *As. Res. Journal*, Vol. v. p. 241, identified by a drawing, given in the Journal.

III. Nos. 17—23. Seven brass and copper Images, presented by R. Home, Esq. *As. Res. Vol. XII*. Appd. p. 23.

Among the number of these Images, a Sesha Naga is mentioned, resting on a tortoise, and as there is only one of that peculiar situation in the collection, it undoubtedly is the same. On examining this figure, I discovered in the inside of the pedestal a cypher made with white oil colour, and by this means I found out the other specimens, which had on the very same place, cyphers of the same colour, and the same hand writing.

IV. Nos. 24—38. Fifteen brass Images from Patna and Allahabad, presented by Dr. Tytler, *As. Res. Vol. XIV*. Appd. p. 3; they had labels upon them, containing the name of the donor, and of the locality.

All of them refer to Shiva, and eight of them have a special allusion to the worshipping of the Lingam in different forms, generally Shiva, or Parvati, or both of them adoring this symbol. I must not omit mentioning, that one of them, a Shiva Lingam, worshipped by Gonesha, Nandi, Kartika, and Sessa Naga, has the crescent and the sun added, as so many more symbols of this worship.

That it is Shiva, however, who is represented in those images, and not another deity, as some at first would suppose, is evident from the trident and crescent being in all the images, though sometimes in a shape and in places which are not apparent at the first glance. These representations are singular for the number of their attributes and the rudeness of the style of the workmanship. No others in the collection exhibit the same rudeness of figure; for the different parts of the body can hardly be distinguished. From this, some would suppose them to be of great antiquity; but all these figures may be regarded as symbols which are formed not in a barbarous, but in a civilised age, and their vagueness and rudeness are designed to suggest to the mind of the worshipper, something indefinite and mysterious in the image which he adores.

V. Nos. 31—67. 1. There are mentioned in the Asiatic Journal, Vol. *XVII*, p. 368, three brass Images, Lokanatha, Durga-Singhbahni, and Goutamah from Nepaul, presented by S. Bramley, Esq. Two of them bear the name of the donor, and the third, Lokanatha, though the name is wanting, has such a striking resemblance to the Goutamah, that we may safely declare it to be the one mentioned in the Journal. The second Goutamah whom I have put together with them, has also so many characteristics in common, that had there been more than three mentioned in the Journal, I should have felt myself justified in assigning it to the same donor.

2. Nos. 48, 49, 50. Three ivory idols. I found no references to them in any periodical of the Society. They are evidently made by the same artist. On one of them "Nepâl" is written with a pencil, and they are moreover so like those just mentioned, that no doubt of their coming from the same country, can arise.

3. The fourteen images under numbers 53-66, representations of Hindoo deities, workmanship, ornaments, &c. being of the same style, are evidently all from the same place, which supposition is confirmed by the labels annexed to them, which are written by the same hand: but neither the name of the donor nor the locality is written. There are seven other Images without labels; but they so strikingly resemble in every particular those just mentioned, that we may assign to them the same country.

This, I think, is Nepâl, for the following reasons:—

a. All of them exhibit a very extraordinary similarity with those presented by Mr. Bramley. The Durga Singhbahni, above mentioned, for instance, corresponds in the principal characteristics with a Durga of this group in the form of Durga Mohish-mardini; we observe the same dress, the same ornaments, the same kind of pedestal. Though the head-dress in both is somewhat different, yet again the shape of the crowns, with all their particularities, is nearly the same, and in many of the images this similarity is still more striking. To this conclusion we are also led by the similarity which is seen in the formation of the head and expression of the countenance, which is seldom found but among people of the same nation, nay, I should almost say, of the same tribe.

b. The strongest confirmation, however, is derived from the workmanship. It is true, this may be under certain circumstances identic, and the artists still belong to

different countries, if for instance they be of the same school. There is, however, nothing in Hindooism, which suggests the idea of such schools. The sects are too much in enmity with each other, the intercourse of the various countries too limited, and the artists of one place too closely adhering to their old established traditions, to authorise the supposition of a school of art, flourishing at different places. If there be a general coincidence in the workmanship of several specimens of Indian art, we may therefore infer on the identity of the country from which they come. Each of these conclusions require some caution, but if all the circumstances from which they are derived, combine, there can certainly be no occasion for doubt, and, on the whole, the principle, that the correspondence in minute and accidental particularities we may observe between a number of specimens of art, constitutes a sufficient reason to identify them in one way or another, according to the circumstances, is certainly well-founded.

c. Another confirmation is their likeness to the three ivory idols, above mentioned. A most remarkable coincidence is especially exhibited between the ivory Durga in the form of Tara, with another of ten arms, as behind the shoulders of both the same standards, with the same emblems upon them, may be observed.

As. Res. Vol. *XV*. Appd. p. 16, is recorded, that Lieut. C. P. Boileau from Nepaul, presented a great variety of brass images to the Society, so that we may assign the images, just named, to him, as there is no other number of images which bears so evident signs of composing one and the same collection, or which would prevent us from ascribing them to Nepaul.

VI. As. Res. Vol. *XVI*. Appd. p. 12, a donation of Images from Arracan is mentioned, consisting of the following specimens:—

1. A wooden model of Gotama's Temple.
2. Brass model of a Temple, used in the worship of Gotama.
3. A tin statute of Buddha, affording a correct model of some of the Arracan Temples.
4. Antient brass model of a Temple, containing four images of Buddha with Nags or Serpents.
5. A brass Statue of Gotama, with an attendant in an erect posture.
6. A wooden figure of Gotama, gilt and highly ornamented.
7. A ditto ditto, plain and gilt.

All these specimens were found with labels, presenting the name of the donor and locality. Further,

8. A wooden figure of Gotama, plain and gilt.
9. Two wooden female devotees of Gotama.
10. A wooden image of a female, called wife of Gotama.
11. Thumb of a large image of Gotama, made of solid stone.
12. A white marble statue of Gotama.
13. An iron figure of Gotama, gilt.

As these specimens on examination were found unique, no doubt could of course arise about their identity.

We find at the same place mentioned the following donations by the same Gentleman:—

14. A copper figure of Gotama, highly ornamented.
15. A brass ditto, gilt.
16. A ditto ditto, highly ornamented, and holding a pot with offerings.



17. Four brass statues of Gotama, crowned, and holding offerings.

18 Ten brass figures of Gotama.

19. A stone figure of Gotama.

The first seven statues were ascertained without difficulty, the short description given of them, being sufficient to discern them among the number of others.

Of the ten Statues of Buddha, I recognise eight from the number 75 to 82 in the list, for the following reasons :—

Three of them are much similar in their ornaments, the shape of their pedestals to those under numbers 71—74. A striking similarity between them is the manner in which the attendants are placed on the corners of the pedestals, and all of them have the same forward bending position. This circumstance alone suffices for vindicating the placing of them under the same group; for though the same ideal of the representation of Buddha, may be observed with Buddhists of different countries, yet it is obvious from even a small collection of specimens of Buddhist art, made at different places, that there is a marked difference between them in little particularities, and such a correspondence being found in a number of specimens, we may safely attribute them to the same country. Moreover, could there be any doubt of this, the similarity in the forms of the face would remove it. If the identity of these three images be granted, we cannot refuse to claim the same decision for the remaining five; for though the attendants do not accompany them, and the pedestals differ, still the national characteristics are too prominent to allow us forming a different opinion. The same holds good with regard to the stone figure.

In concluding this report I beg to observe, that many of the Members of the Society undoubtedly have a recollection of the circumstances under which some of the antiquities were laid before the Society, and with regard to those antiquities which are not yet identified, especially the statues and sculptures, I would request them to favour me with such information, as they are able to give about them.

I have the honour to be,

Sir,

Your obedient Servant,

E. ROER.

3rd June, 1842.

I — *Antiquities which have been identified.*

A.—*Egyptian.*

1. Figure of wood.
2. Ditto ditto.
3. Ditto of Porcelain
4. A Head made of clay.
5. A Head made of wood.

*Presented by Lieut. Young, (see Jour. As. Soc. Vol. VI. page 987.)*

- 6 to 11. Porcelain figures, with Hieroglyphic characters.
12. A figure of metal, representing Isis with a Horace on her lap.
13. A ditto ditto of wood.
14. A figure of metal.

*Presented by Capt. Bidwell, (see As. Researches, Vol. XIV. Appendix p. 3.)*

15. A beetle made of plaister, with Hieroglyphic characters.

B.—*Persian.*

16. A copper figure, dug up near Bushire.

*Presented by Capt. J. Hennel, (see Jour. As. Soc. Vol. V. p. 241.)*

C.—*Indian.*a. *From Patna or Allahabad.*

17. A brass Sésha resting on the tortoise.  
 18. A copper Bhavani, with a lion's head, canopied.  
 19. A copper figure of Parvati.  
 20. A ditto ditto.  
 21. A copper figure of Ganesa.  
 22. A copper figure of the Infant Crishná.  
 23. Figure of Buddha.

*Presented by R. Home, Esq. (see As. Researches, Vol. XII. Appendix p. 23.)*

24. A brass figure of Siva with five heads, from Allahabad.  
 25. Four brass figures of Bhairava, adoring the Lingam.  
 26. A brass figure of Shiva, from Allahabad.  
 27. Two brass figures of Shiva, adoring the Lingam.  
 28. One brass figure of Shiva, from Allahabad.  
 29. A brass figure of Kali, attended by her Lions, from Allahabad.  
 30. A brass figure of Shiva.  
 30. a. A brass figure of Shiva, from Allahabad.  
 31. A brass figure of Shiva, adoring the Lingam, from Allahabad.  
 32. Two brass figures of Shiva, adoring the Lingam.  
 33. One brass figure of Parvati, adoring the Lingam.  
 34. Ganesa and Kartika, adoring the Lingam.  
 35. Brass figures of Siva and Parvati, from Patna.  
 36. A brass figure of Parvati, from Allahabad.  
 37. A brass figure of Parvati, from Allahabad.  
 38. A brass Arrotee, from Allahabad.

*Presented by Dr. R. Tytler, (see As. Res. Vol. XIV. Appendix p. 3.)*

D.—*Antiquities from Nepal.*1.—*BUDDHIST.*

39. A copper figure of Gotamah, holding offerings.  
 40. A copper figure of Gotamah, holding offerings.

*Presented by S. Bramley, Esq.*

41. A brass Budhistical figure.

—————*Donor ?*

42. A brass Buddhist figure.  
 43. A brass female Buddhist figure.

*Presented by Lieut. J. P. Boileau, (see As. Researches, Vol. XII. Appendix p. 16.)*

2.—*HINDU.*

44. A copper figure of Lokanatha.

*Presented by S. Bramley, Esq. (As. Jour. Vol. II. p. 368.)*

- 45. A brass figure of Lokanatha.
- 46. A ditto ditto.
- 47. A wooden figure of Lokanatha.

*Presented by Lieut. J. P. Boileau, (As. Res. Vol. XIII. Appendix p. 16.)*

- 48. An ivory figure of Durga in the form of Tara, (4 arms with the skull of a giant in one hand, and surrounded with the necklaces of Human Skulls.)

————— *Donor ?*

- 49. An ivory figure of Baráha Avatar, (with the attributes of Tara as above specified.)

————— *Donor ?*

- 50. An ivory figure of Ganésa.

————— *Donor ?*

- 51. A brass figure of Tara.

*Presented by Lieut. J. P. Boileau, (see As. Res. Vol. XIII. Appendix p. 16.)*

- 52. A brass figure of Durga Mohish Mordinee, (with eight hands.)
- 53. A ditto ditto of Garuda.
- 53. a. A ditto ditto of Shiva.
- 54. A brass figure of the first incarnation of Shiva, "Matseea Avatar."
- 55. A brass figure of the second incarnation of Shiva, "Koorma Avatar."
- 56. A ditto ditto of the third incarnation of Shiva, "Borahá Avatar."
- 57. A ditto ditto of the fourth incarnation of Shiva, "Nursingha Avatar."
- 58. A ditto ditto of the fifth incarnation of Shiva, "Vamana Avatar."
- 59. A ditto ditto of the eighth incarnation of Shiva, "Sree Krishna Avatar."
- 60. A ditto ditto of the Kalika Avatar.
- 61. A brass figure of a Vishnú, with four arms.
- 62. A ditto ditto of Narain and his Spouse "Luksmee."
- 63. Three brass figures, Krishna with two female attendants.
- 64. Three brass figures, Ram, Lokhana, and Sitta Dévi.
- 65. A brass figure.
- 66. A ditto ditto of the goddess Kalee.

*E.—From Arracan.*

#### I. BUDDHIST.

- 67. A copper figure of Gotamah, highly ornamented.
- 68. An iron figure of Gotamah, gilt.
- 69. A brass figure of Gotamah, gilt.
- 70. A ditto ditto highly ornamented, and holding a pot with offerings.
- 71 to 74. Brass statues of Gotamah, crowned and holding offerings.
- 75 to 82. Brass figures of Buddha.
- 83. A brass statue of Gotamah, with an attendant in an erect posture.

*Presented by Dr. R. Tytler, (see As. Researches, Vol. XVI. Appendix p. 12.)*

84. A stone figure of Gotamah.

————— Donor ?

- 85. A brass statue of Gotamah, with a crown, and ornamented.
- 86. A wooden figure of Gotamah, gilt and highly ornamented.
- 87. A wooden figure of Gotamah, plain and gilt.
- 88. A wooden figure of Gotamah, plain and gilt.
- 89 to 90. Two wooden female Devotees of Gotamah.
- 91. Ancient brass model of a Temple, containing four images of Buddha, with Nagas, or Serpents, over the entrance.
- 92. Thumb of a large image of Gotamah, made of a solid stone.
- 93. A tile representing the foot of Gotamah, impressed with the figures of Buddha.
- 94. A wooden image of a female, called the wife of Gotamah.
- 95. A wooden model of Gotamah's Temple.
- 96. A brass model of an Arracan Temple, used in the worship of Gotamah.
- 97. A statute of Buddha, affording a correct model of some of the Arracan Temples.
- 98. A Siva Lingam, procured in a Temple at Keykeramdong.
- 99. A white marble statue of Buddha. *Donor, Dr. R. Tytler (see As. Researches, Vol. XVI. Appendix, p. 12.)*
- 101 to 113. A set of Arracanese Griffin Weights of brass. *Donor, Captain Bogle, (see As. Journal, Vol. VI. p. 987.)*
- 114, 115, 116. Figures of Buddha, gilt. *Donor ?*
- 117. An earthen sculpture of Buddha, with two attendants, and Sanscrit Inscription, from Tagoung, about 100 miles from Ava.
- 118. An earthen sculpture of Buddha, with Sanscrit Inscription.

*Presented by Captain Hannay, (see As. Journal, vol. V. p. 126.)*

119. An earthen sculpture of Buddha, with Sanscrit Inscription.

*Presented by Prince Alakara, (see Journal As. Society, Vol. X. p.—)*

- 120. An earthen sculpture of Buddha, with Sanscrit Inscription. *Donor ?*
- 121, 122. Earthen sculptures of Buddha, with Sanscrit Inscription, gilt.

————— Donor ?

- 123, 124. Marble statues from Pagahna Mew, a town in the Birman Empire, situated on the East side of the Irrawaddy River. Lat. 21° 9' N. Long. 94° 35' E.

*Presented by Captain Ross, (see As. Researches, Vol. XVI. Appendix p. 12.)*

125. A stone Lingam with Sculptures.

*Presented by Dr. R. Tytler, (see As. Researches, Vol. XV. Appendix p. 36.)*

F.—From Java.

- 126 to 201. A brass figure, supposed to be "Kartika" seated on a Peacock, with a Lion's mouth, and holding a spear in his right hand.
- 127 to 202. A brass figure, sitting with crossed legs on a state chair.

**II.—*Idols and Antiquities not identified with regard to their Donors and Localities.***

**1.—BUDDHIST.**

- 126. A brass figure of Buddha.
- 127. A wooden model of Buddha.
- 128, 129. Copper figures of Buddha.
- 130. A brass figure of ditto.
- 131, 132. Copper figures of ditto.
- 133, 134, 135. Copper figures of Buddhas holding offerings.
- 136. A small copper bell in the shape of Gotamah.
- 137, 138. Copper Budhistical figures.
- 139 to 142. D. D. ?
- 143. *a.* A copper Buddhist figure with ten hands, gilt.
- 143. *b.* A copper mould and lead cast of five Buddha figures.

**2.—HINDU.**

- 144. A brass figure of Siva and Parvati.
- 145, 146. Copper figures of Parvati.
- 147. A brass figure of Siva, with four hands.
- 148. A copper figure of Siva, in a sitting posture.
- 149. A brass figure of Durga Mohish Mardini, with eight hands.
- 150. A brass figure of Durga, with eight hands, destroying the Asura.
- 151, 152. Copper figures of Durga Singh Bhani.
- 153. A copper figure of Gonesha, sitting on a rat.
- 154. A brass figure of a Devotee, being the representation of the Lingam worship.
- 155. A copper figure of Siva, with four hands.
- 156. A brass figure of Vishnu.
- 157. A copper Bhavani, with a Lion's head, and canopied by Sésha Naga.
- 158. A copper figure of Lokshmi.
- 159. A ditto ditto.
- 160. A brass figure of Vishnu.
- 161. A copper Kalika Avatar, mounted on a horse.
- 162. A ditto ditto.
- 163, 164. Brass figures of Krishna.
- 165. A copper figure of young Krishna.
- 166. A copper figure of infant ditto.
- 167. A copper figure of Krishna, standing under a tree.
- 168. A copper figure of Radha.
- 169. A brass figure of — ?
- 170. A ditto ditto of — ?
- 171. A brass figure of a Devotee holding offerings.
- 172. A copper figure of Hanúman.
- 173. A ditto ditto.
- 174. A brass figure of Hanúman on one side, and of a Devotee, on the other.

- 175. A brass figure of a Munee or Devotee.
- 176. A ditto ditto of a Devotee.
- 177. A ditto ditto of a Female.
- 178. A brass figure of a Female under an arch.
- 179. A ditto ditto canopied by Naga.
- 180. A brass figure of a Devotee.
- 181. A copper figure — ?
- 182. A brass figure holding a snake with both hands.
- 183. A brass Arrotee, containing five oil burners, and the figures of two men and a female.
- 184. A copper cast of a Peacock.
- 185 to 188. Earthen casts of figures, with Sanscrit Inscriptions.
- 189,190. Copper Snakes.
- 191. Copper Snake, with five mouths to a head.
- 192. A copper Bull and a figure, canopied by Naga.
- 193. A brass Bench.
- 194,195. Copper moulds for casting the Lingam.
- 196,197. Brass moulds for ditto ditto.
- 198. A copper head of a Human Figure.
- 199. A procelain figure of an Ape.
- 200. A brass figure of a Female Dancer.

Read letter from B. H. HODGSON, Esq. Resident of Nipal, with a specimen of the style in which Mr. F. HOWARD, the celebrated illustrator of Capt. HARRIS' African Beasts, proposed to bring out his mammals and birds of Nipal. There are about 100 quadrupeds which Mr. HOWARD will give for No. 50 in alternate monthly numbers of twenty plates, each No. to cost Rs. 10.

Read a further letter from the same gentleman, enquiring if the Tibetan mammals and birds sent by him through various channels (specified) had been received, and advising the dispatch of thirty-one drawings for exhibition at the Society's Meeting, and for ultimate transmission to London, "so that in India and England the authorities and public may resort to their promise to support the work by subscription."

The drawings referred to were exhibited; and the subject, it was remarked by the Secretary, would have the notice it deserved in an early number of the Journal.

The Secretary exhibited some specimens of *Ningpho China*, consisting of cups, sugar pots, flower vases, intended to be hung on the walls of a room; imperial pattern plates, and basons, Chinese scales, and other articles presented by Lieut. J. BROCKMAN, H. M. 50th Regiment; some of these articles, although of a trifling nature, were valuable as curiosities.

Read a letter from Mr. D. Ross, offering for the acceptance of the Society an old mineral glass case.

Read letter from the Honorary Secretary of the Royal Asiatic Society, London, of the 4th December 1841, conveying thanks of the Royal Society for five numbers (109 to 113) of the Journal of the Asiatic Society of Bengal.

Read the following letter from J. H. BATTEN, Esq., of 8th February, 1842:—

MY DEAR TORRENS,

*Almorah, February 8, 1842.*

Having returned to Almorah, I lost no time in sending off an instalment of the Herbert MSS. to the Asiatic Society, and accordingly on 6th instant I despatched by dāk to your address, a packet containing two neatly written vols. which can at once be printed off. These vols. contain a Journal of Herbert's visit to the lower ranges of Sirmoor, and the low country and hills about Bark and Roopur, below the Soobathoo mountains, to the Terrai east of the Jumna, belonging to the Suharunpore Zillah, to the Dehra Doon, and thence crossing the Ganges along the edge of the Bijnore, and Moradabad and Pilibheet Terrai, to that of Kumaon, and to Bhamouree Pass, and thence by the Bheemtal route to Almorah. Captain Herbert stayed at Almorah a whole summer, and recorded observations. Thence his Journal shews his tour in a NNE. direction towards the Juwakee Pass, (Oonta Dhooora,) and the Snowy range from which flows the Goree river, one of the main feeders of the Goggra river. Before reaching Melum, Herbert fell ill, and his Journal ends.

I have three other vols. of Manuscript. These are all badly written, and parts of them are very obscure. One of the vols. is written topsy-turvily, *i. e.* one set of observations are recorded on one side of a page, and another set on the other, and large *lacunæ* intervene. Luckily this volume relates to Kumaon, and British Gurhwal, tracts with which I am intimately acquainted, and my local knowledge enables me to decypher the names of places, and connect the threads of the narrative. I assure you that nobody at Calcutta can possibly interpret the volume in question. I therefore, propose to edit it myself, only asking time, say, to the close of the rains, for the work. James Prinsep gave up the task in despair, and I would not keep the vol. in question for a day, if I thought that his successor in Calcutta could really make any thing out of the MS. This vol. also contains Captain Manson's continuation and completion of the Journal which Herbert discontinued from illness, and the tale is thus carried on from where Herbert stopped, to Melum and Oonta Dhooora Pass, (a highly interesting tract which I have myself visited,) and back over the hills to Almorah. This part can be separately transcribed by me now, (*i. e.* before the rains,) and sent to the Society. In its present state I defy any one, who has not been at every spot named, to decypher the words, and to fill up the gaps caused by moths and white ants.

The 2nd vol. contains a Journal by Capt. Manson, (Herbert's then Assistant, now Commissioner with Bajee Rao,) of a tour from Almorah to the outposts at Petorah Gurh and Lohoghat, and thence through the hills nearest the plains, to Bheemtal. The writing in this vol. has become very obscure from time and the ravages of insects, but I hope, with the aid of my map and local knowledge, to decypher the whole of this little narrative. In this vol. as in the others, there are double sets of numbers for the

2274


rock specimens, thus: No. 160—Greenish white quartzose rock, &c. &c.

No. 2275

161. Greyish rock approaching to porphyritic.

The 3rd vol. is, I believe, first in order of time, but the dates of months are for the most part given, and not those of years. Prinsep's note makes the year of this Journal to be 1826, and this would appear to be correct. It begins with *Chilkeea*, the mart for hill productions between the Kumaon Terrai and Casheepoor; thence the Journal describes Herbert's tour up the Kosilla river into the Kumaon Hills viâ Dhikkolee and Chokoom as far as Okuldoonga, where he left the river and ascended to Tarket. It then shews his return to Chilkeea, and passage through the Terrai to Haldooa and Casheepoor, and thence along the edge of the forest in a westerly direction to Jaspoor Burrapoor, Kadirkote, and Nujeebabad to Nagul, where he crosses the Ganges, and marches by Bhogpoor to Hurdwar, and thence through the lower hills and Doon to Dhera. At Hurdwar, Capt. Herbert makes the following note: "I begin here to number my second thousand with the printed Nos. from 1," but in all this vol. there are double numbers, thus:—

77.4	}	rolled specimens, chiefly hornblendic sent to Dehea.
78.5		
79.6		
80.7		

The larger numbers representing, it would seem, the general series; the smaller, the series obtained at any particular spot. From Dehra, Herbert made excursions to Sunsur-Dhara, the celebrated dripping rock, and Col. Young's house on the hills, called "the Potatoe Garden," now a part of the great station of Mussooree. His geological observations here are very full, as are those in the range near Hurdwar. At Dehra he examined Mr. Shore's well, and describes its strata to the depth of 22½ feet. He afterwards describes his march through the Doon and across the Jumna to *Kalsee*, where he regularly enters the hills. He thence marches through Jounsur, Joobul, &c. by a circuitous route to the Burin or Brooang Pass, (the Borendo of the Simla folk,) thence down the Pabur river to the Tonse, and Jumna countries, and to Dehra Doon by the Aglar valley and over Mussooree range. From Dehra Doon to Suharunpoor, Meeruth, Moradabad, Ganges Ghât, and down the river to Calcutta, and on his way down he narrowly escaped drowning at Colgong. In this vol. there are mention of 379 specimens, and Herbert in a note written in July 1827, (at Almorah I believe,) says, that these specimens were left at Moradabad, and had by an accident, become very much damaged in their envelopes. He records the shape of the labels in this series (viz. the 2nd 1000) as  and he notes the doubtful, loose and remaining numbers.

The country described in this volume has been subsequently examined by numerous travellers, as it is that chiefly visited from Simla and Mussooree, and I do not think that anything very novel will be brought to light by the Journal:— but, if it can give a clue to the *labels* and *specimens* at Calcutta, you will think it valuable, and I therefore propose to despatch this vol. to-morrow to your address. Allusions in it are frequent, I see, to places in Kumaon, as Powree; at Sreenuggur Dheeanneekot near Almorah; Jilmilputteen near Kedarnath; Punnae on the Aluknunda, noted for its



curious greywacke and also metalliferous talcose rocks; Dheenpoor, the site of some large copper mines in this province, &c. This fact shews that Herbert had visited the Province, before the period of the Journal which I propose to edit. Yet, I have never seen any record of his tour to Sreenuggur, Kedarnath, &c., that is of his first visit to Kumaon, and that part of Gurhwal which is attached to this province, and I should like much to discover some Journal of the tour in question. Mr. Piddington will find the volume of MS. which I propose to send to-morrow, less kakographic and more easy to decypher than the volume which I retain, (there being no breaks to, and no great admixture of other matter with the narrative,) moreover, numbers of people, and among them my friend Pratt, know the country described. It is a great pity that Dr. McClelland confined (no fault of his though) his observations in Kumaon to the immediate neighbourhood of Lohooghat and Pctora. Had he examined the country South-West and North of Almorah, he would have been able to edit Herbert's Kumaon volume, and to elucidate Manson's mysterious pothooks. As it is, you must kindly beg the Asiatic Society to be thankful for the MSS. already sent, and the MS. promised by to-morrow's dāk, and to await with patience (for I have not much leisure,) my edition of Herbert and Manson's Kumaon Journal, which I will endeavour to make as luminous as possible.

Believe me to remain,

My dear Torrens,

Yours very sincerely,

J. H. BATTEN.

The letter having been read, it was proposed by the Lord Bishop, seconded by the President,—That the thanks of the Society be voted to Mr. BATTEN for the valuable services rendered by him in the recovery and transmission of the late Captain HERBERT's manuscripts, and that the acknowledgments of the Society be tendered to Mr. BATTEN for his offer of editing the late Captain HERBERT's and Major MANSON's Journal in Kumaon.

Read the following report submitted by the Curator of the Museum :—\*

SIR,

Since my last Report to the Society, the following donations of Zoological specimens have been received for the Museum.

From Dr. Wallich, a very fine specimen of the true *Zibet* of Buffon, or *Viverra Zibetha* of Linnæus, being a species of rare occurrence in European Museums, indeed I only know of one specimen which is in the British Museum, for the *Tanggalung* of the Malays, regarded as Buffon's Zibet by the brothers Cuvier, is quite a different animal, which has since been termed *V. tanggalunga* by Mr. Gray: the present species is the *V. melanura* of Mr. Hodgson, and an interesting notice of its habits, with a very recognisable figure, occurs in Williamson's 'Oriental Scenery'; there is also a figure and notice of this species in the 1st No. of Dr. McClelland's 'Journal of Natural History.'

Likewise a female specimen of *Parodoxurus typus*, which has been added to the collection of stuffed mammalia.

In the class of Birds, I have the pleasure to record the donation, from Government, of a beautiful recent specimen of *Tragopan satyrus*, which has been mounted.

\* This Report should have been published with the "Proceedings of the Asiatic Society," at p. 274, and have preceded the Report given at p. 444 *et. seq.*—*Cur. As. Soc.*

From W. Masters, Esq. a recent Chinese Lory (*Lorius Sinensis*).

From R. W. G. Frith, Esq. through Mr. Hampton, mounted specimens of the following species of Birds.

*Athene Brodiei*: *Noctua Brodiei*, Burton, *P. Z. S.*, 1835, 152, seu *N. tubiger*, Hodgson, *As. Res.* XIX, 175, bearing date 1836.

*Garrula leucogenys*, Nobis: being the eighteenth species of this genus with which I am now acquainted from Northern India. This generic title holds precedence of *Crateropus*, Swainson, and *Ianthocincla*, Gould, applied to the same group, certain species of which have been referred to *Cinclosoma* by Mr. Vigors, and others by Mr. Hodgson. I have elsewhere endeavoured to reduce the synonyms of the various members of this genus, and have prepared descriptions of the present and another new species, for which *vide p.* 180, *ante*.\*

*Francolinus vulgaris*.

*Fr. Pondicerianus*: *Tetrao Pondicerianus*, Gmelin; *Perdix orientalis*, Latham, but not of Horsfield. A figure and interesting notice of the habits of this species have been published in the 'Bengal Sporting Magazine,' for October, 1840.

*Fr. gularis*: *Perdix gularis*, Tem: figured as the *Chicore*, in the 'Bengal Sporting Magazine' for September, 1839, but which must not be confounded with the true *Chicore* (*Perdix Chukar*) of the Himalaya.

*Ortygis*, allied to *Hemipodius atrogularis*, Eyton, *P. Z. S.*, 1839, 107, and scarcely less so to *O. pugnax* and *O. taigoor*, all these species having a black throat and fore-neck in the mature male, and which is broader in the present species than in the two latter: from these it is readily enough distinguished by the predominance of black on the upper parts, the more strongly marked large oval spots of this colour on the wing-coverts, and the hue of the belly which is merely tinged with rufous; size intermediate. On some future occasion, I hope to do something towards elucidating the Quails, dwarf Partridges, and *Ortyges* of India, which at present are a most perplexing group, notwithstanding the exertions of Col. Sykes, and of subsequent investigators, who as yet have but very partially analysed the numerous species.†

Of the foregoing six species of birds presented by Mr. Frith to the Society, four are new to their Museum; viz. the tiny Owl, the *Crateropus*, the Wood Partridge, and the *Ortygis*.

Numerous specimens of birds have also been added to our collection, procured in the bazaar, among which it will be sufficient to notice a few of the more interesting.

*Caprimulgus macrourus*, Horsfield, *Lin. Trans.* XIII, 142. A very handsome male. We before possessed specimens of what appear to me to be the female of this species, and which, if so, are remarkable for the pale colour predominating much more than in the other sex.‡

*Tringa platyrhyncha*, Temminck. A male in winter plumage; one in summer garb, from the old China collection, having been already in the Museum. The only additional species of this genus, which I have hitherto met with, are—*Tr. subarquata* which is not rare, and *Tr. minuta*, which is exceedingly abundant.

\* I have since become acquainted with several additional species, which I shall describe in a more elaborate monograph of the genus.—*Cur. As. Soc.*

† I have since prepared the analysis above mentioned, which will appear in a subsequent Report: the bird above noticed is Mr. Eyton's *atrogularis*.—*Ibid.*

‡ This appears to be common in Nepal.—*Ibid.*

*Recurvirostra Avocetta* : fine specimens.

*Botaurus stellaris*. The European Bittern, a handsome female.

*Pluvianus cinereus*, Nobis; being the sixth Indian species of this genus with which I am acquainted: length of a female 14 inches, by  $2\frac{1}{2}$  feet in extent; wing from bend  $9\frac{1}{2}$  inches, and tail  $4\frac{1}{2}$  inches; bill to forehead  $1\frac{1}{2}$  inch, and bare part of tibia the same; tarse 3 inches. Irides dilute red, with a cast of brown; orbital skin, small frontal lobes, basal three-fifths of the bill, and the legs, bright yellow; the rest of the bill black, as are also the claws. General colour of the upper parts pale greyish-brown, the head, neck, and breast, pure light grey, passing into black on the lower part of the breast, which terminates abruptly, contrasting with the white belly; primaries, their coverts, and the winglet, black; the secondaries and their coverts chiefly white, and the tertiaries concolorous with the back: upper tail-coverts white, slightly tinged with brownish; and tail pure white, having a black subterminal band, broad on its medial feathers, nearly obsolete on the penultimate, and quite so on the outermost. This species is new to the Museum, and I have seen but this one specimen.

*Rallus gularis*, Horsfield. Beautiful specimens.

*Phalacrocorax pygmæus*, Auct.

*Rhynchea picta*. I merely notice this handsome species, a fine series of which has been put up, to remark that an affinity which I long ago detected and commented upon, between this genus and the American *Heliornis*, is strikingly manifested by the living *Rhynchea*. The style of colouring and markings correspond, and the American genus is styled *Heliornis* (or Sun Bird), from its habit of spreading out the wings and tail, upon surprise, and so forming with them a sort of radiated disk, whereon the elegant markings are beautifully displayed. The same habit is observable in *Rhynchea*, which thus shews off its spotted markings to the admiration of the beholder, menacing the while with a hissing sound and neck contracted, when suddenly, seizing a favourable opportunity, it darts away upon the wing. Mr. Gray (in *P. Z. S.*, 1831, 62,) has attempted to define two alleged species of Indian *Rhynchea* by the names *Picta* and *Capensis*, the former only of which he had himself seen from Africa as well as from India and China; but he refers to Savigny's figure of *Rh. Capensis*, in the *Oiseaux d'Egypte*, as furnishing a faithful representation of the other. Should they be different, however, the attempted definitions need to be rendered more intelligible, as neither comparison of them with specimens, nor of the latter with Savigny's figure, has enabled me to decide to which the Bengal bird should be referred, and certainly the considerable number which I have seen and examined of this latter were all of the same species. Among a number of African and Indian specimens of birds identical in species which were exhibited by Col. Sykes before the Zoological Society, as noticed in *P. Z. S.* 1835, 62, were examples of a *Rhynchea* styled *Capensis*, Stephens.

In the class of Reptiles, a specimen of the *Python Tigris*, fifteen feet in length, has been purchased alive and been killed; its skin has been mounted, a number of preparations made of its viscera, and the skeleton is now in process of being cleaned. A considerable number of other skeletons, chiefly of birds, have also been laid by to be set up as opportunity will permit of it.

Mr. Frith's donation comprised, in addition to the birds which have been mentioned, a few specimens of insects, together with some pupa-envelopes constructed of bits of plant-stems, though by what species I am unacquainted.

The following are the dimensions of the magnificent Gaour of which the skin, prepared for being set up in our Museum, is now in progress of transmission from Chyebassa, as already noticed by the Secretary. They were taken by Lieut. Tickell from the recent animal, and I annex a copy of the figure which he has kindly supplied me with, in order to enable our taxidermists the better to imitate the form of the living beast in the stuffed specimen.

						Feet. Inch.	
A, B, a string passed along the back to root of tail,	....	....	....	....	....	8	8½
A, a, from frontal ridge to tip of muzzle,	....	....	....	....	....	2	0
c, d, horns apart anteriorly at base,	....	....	....	....	....	1	0½
e, f, tip to tip of ditto,	....	....	....	....	....	2	3½
A. g. from nose to centre of eye,	....	....	....	....	....	1	0½
g, h, eye to root of horn,	....	....	....	....	....	0	4½
g, k, eye to base of ears,	....	....	....	....	....	0	6
l, m, humerus, &c.	....	....	....	....	....	1	11½
m, n, radius,	....	....	....	....	....	2	8
n, o, metacarpus,	....	....	....	....	....	0	9½
o, p, pastern, &c. and hoof,	....	....	....	....	....	0	7½
q, r, pelvis,	....	....	....	....	....	1	4½
r, s, femur,	....	....	....	....	....	1	7½
s, t, tibia and fibula,	....	....	....	....	....	1	10
t, v, metatarsus,	....	....	....	....	....	1	4
v, w, pastern to end of hoof,	....	....	....	....	....	0	7½
C. D. perpendicularly, about	....	....	....	....	....	5	9
C. X. length of dorsal ridge,	....	....	....	....	....	2	5½
tail-root to tip of hairs,	....	....	....	....	....	3	1½
k, y, circumference of head behind horns,	....	....	....	....	....	3	11
i, z, neck behind ears,	....	....	....	....	....	4	0½
C, 2, chest,	....	....	....	....	....	8	8
3, 4, muzzle,	....	....	....	....	....	1	9½
5, 6, fore-arm close to axilla,	....	....	....	....	....	1	11½
7, 8,	....	....	....	....	....	0	9
9, 10, thigh close to body,	....	....	....	....	....	3	0½
11, 12, thigh close above hock,	....	....	....	....	....	1	6

"Irides grey; muzzle black; horns pale, with dark tip; hoof, blackish."

I am, Sir,

Yours obediently,

ED. BLYTH.

#### Report for May Meeting.

SIR,—On the present occasion, I have comparatively few donations to announce to the Meeting.

In the class of mammalia, our most interesting acquisition is the remarkably handsome Fox from beyond the Sutlej, already announced as having been presented by Mr. Lushington. I presume it to be the *Vulpes Nipalensis*, Gray, *Mag. Nat. Hist.*, N. S., I, 578, according so far as can be made out from the very imperfect description there given; but notwithstanding the differences of colour, and length and quality of

fur, apparent between this and our specimen of the common Himalayan Fox, upon which Dr. Pearson founded his description of *V. montanus*, vel (subsequently) *V. Himalicus*, Ogilby, I cannot, after full consideration, regard them as specifically distinct, but consider this to be a variety merely, from a colder habitat, or perhaps a winter-killed individual, though I am unaware that any of the *Canidae* renew their coat more than once in the year. Certainly, with regard to the name *Nipalensis*, Mr. Hodgson, who has so long pursued his zoological researches in that province, would seem to be unaware of any Nepålese species additional to *V. montanus* and *V. corsac*; a circumstance which also tends to cast a doubt upon the *V. Hodgsonii*, likewise insufficiently described by Mr. Gray, *loc. cit.* The specimen now exhibited may, indeed, be tolerably well referred to either of the *half-descriptions* indicated.\*

Length thirty inches from nose to base of tail, the tail with hair sixteen inches; from nose to base of ear five inches and a half, and ears (measured posteriorly, and making some allowance for their having shrunk,) four inches; height of the back fifteen inches. Fur exceedingly rich, dense, soft and fine, the longer sort measuring fully two inches upon the back, and the inner everywhere of considerable length and woolly character. General colour pale fulvous, scarcely more than fulvous-white over the shoulder-blades, and but little deeper on the sides, the haunches and tail appearing greyish, while the middle of the back is much deeper and more rufous fulvous than the rest, widening upon the croup, and passing there into the greyish appearance of the haunches; outside of the ears deep black to near their base (as in ordinary *montanus*); and the under-parts mingled white and faint nigrescent, the latter being the general hue of the inner fur at base, and more or less developed on different parts. Head light fulvous mixed with white, and marked as in other Foxes; the darkish streak from the eye to the moustachial bristles faint, the latter black, and cheeks and jowl white as usual. Limbs about the same pale fulvous as the head, the ordinary mark in front of the fore-limbs inconspicuous, though indicated by grizzled black and white-tipped hairs: tail bushy and white-tipped, with also a white mark across its upper surface near the base, above which the colour is the same rufous-fulvous as the croup, while ascending on each side of the buttocks is some whitish, which is divided by a narrow rufous stripe at the mesial line; the rest of the tail being pale dull fulvous with the hairs slightly black-tipped.

Captain Hutton states (*J. A. S.* VI, 934,) of *V. montanus*, that "the males are larger and much darker than the females." The very pale specimen, however, here described is a male: and should my specific identification of it be correct, the *V. mon-*

\* "*Vulpes Nipalensis*. Fur soft, silky, long; above, bright fulvous-yellow.

"Inhabits Northern India, Nepål.—*Gen. Hardwicke*.

"Like the common European, and American fulvous, Foxes; but the fur is much softer and brighter coloured.

"*V. Hodgsonii*. Fur rather woolly; above, bluish grey. Forehead, nape, and middle of the back, yellowish-brown. Tail-end, black. Chin and beneath, white.

"Inhabits North India, Nepål.—*Hardwicke*."

With respect to "tail-end black," I suspect that Col. H. Smith's observation will be found to apply, that "of the hundreds of [English] Foxes and skins examined by us, although there be many with the end of the tail apparently black, we have not found one where there was not a white tip within the black; although most Foxes occasionally pull out the hairs at the end of the tail." Dr. McClelland writes, of the Fox of Kemaon, "he has grey legs, becoming darker to the feet; dark sharp nose; bushy tail, *that of the male having a white tip*; the upper surface of the ears velvet-black, inner surface cream yellow." '*Geology, &c. of Kemaon*,' p. 220.

*tanus* would accordingly appear to be subject to considerable variation in shade of colour, like the allied *V. fulvus* of North America. In connexion with this subject, I may further remark, that Lieut. Irwin mentions "black fox" skins, together with those of the "common brown fox," as among the "commodities sent from Independent Toorkistan to the marts of Chinese Toorkistan.\* "The Fox of Toorkistan," he observes, "and generally of the cold and temperate countries, has all the cunning of the English, unlike the puny Fox of India"; the former probably referring to the common Himalayan species, rather than to the Tibet Fox (*V. ferrulatus*) of Mr. Hodgson; though regarding the cunning of those of Kemaon, Dr. McClelland writes—"They are somewhat larger than the English Fox, and are very easily caught in traps," whereas the Jackal there, which is much larger than the Jackal of the plains, is remarkably shy and cautious, so much so as never to allow itself to be caught in a trap."†

In Afghanistan, according to Dr. Griffith, "a large and a small species of Fox appear to exist. The former, which is perhaps identical with the large Himalayan Fox, I procured from Quetta and at Olipore, at which place it is not uncommon.‡ The small kind seems to resemble the Fox of the plains of N. W. India."

Of the latter, or more exclusively those of the great Western Hurriana desert, the Hon. Mountstuart Elphinstone remarks, that these are "less than our [the English?] Fox, but somewhat larger than the common one of India: their backs are of the same brownish colour with the latter; but in one part of the desert, their legs and belly up to a certain height, are black, and in another, white. The line between those colours and the brown is so distinctly marked, that the one kind seems as if it had been wading up to the belly in ink, and the other in white-wash." *Account of Cabul, &c.* p. 7. Specimens of the animals here indicated would be highly acceptable to zoologists.

I have been informed that a species more nearly resembling the English Fox than the small Corsac of the plains inhabits the Neilghierries; but no such animal is noticed in Mr. Elliot's catalogue.

In *Proc. Zool. Soc.* for 1837, p. 68, it is mentioned that "a new species of Fox, nearly allied to *Vulpes Bengalensis*, but evidently larger, Mr. Gray designated as *Vulpes xanthura*," but no description is there published, nor habitat assigned, though this notice follows some descriptions of Indian animals. Naturalists, therefore, are not bound to trouble themselves about the priority of the name, should they chance to meet with the animal here alluded to. It cannot, surely, be the "Fulvous-tailed Dog (*Canis chrysurus*, Gray)," a description of which is published in *Mag. Nat. Hist. N. S.* I, 157, and which is stated to inhabit India. I subjoin reasons, however, for suspecting that it is the same, and here indicate the animal as one regarding which further information would be acceptable.§

\* Red, grey, brown, and black Foxes are stated to have been formerly very numerous in the Aleutian Isles, whence the name of "Fox Islands" applied to this group, or rather chain. Does the American species extend across to Asia like the Rein Deer, Argali (?), &c.?

† Captain Hutton remarks, of the Jackals of Simla, that "they do not appear to hunt in packs as they do in the plains, but are seen singly." *J. A. S.*, VI, 934. Is it certain that they are of the same species?

‡ For further particulars concerning *V. montanus*, vide *J. A. S.*, VI, 934.

§ "Fur pale, foxy, varied with black-tipped rigid white hairs, which are most abundant on the sides, and only scattered on the hinder part of the back. Under fur soft, silky; of the back

The wild *Canidæ* of India may, I suspect, be reduced to the following species :—

Subgenus *Cuon*, Hodgson, vel *Chryseus*, H. Smith, perhaps comprising a plurality of species, though actual comparison of specimens is necessary to establish these.

"Upon the Himalaya," writes Mr. Ogilby, "the common Wild Dog, called simply *Jungle Coota* in the plains, and *Buanru* in Nepal, [*Colsum* or] *C. Dukhunensis* of Sykes, and *C. primavæus* of Hodgson), is only found in the lower regions, but is replaced further up by two other wild species, likewise called *Jungle Coota* by English sportsmen. Lieutenant Smith informs me, that one of these is larger and the other smaller than the *Jungle Coota* of the plains, from which they both differ in having shorter tails and a lighter or more ashy colour: both species ascend the hills even to the snow-line; they hunt in packs, and inhabit ravines, and rocky dells; but being excessively shy, are not very often seen. The *Jungle Coota* of the plains, in other respects, does not appear to me to differ from the *C. Sumatrensis* of Hardwicke."\* *Zoological Appendix to Royle's Illustrations.*

Mr. Hodgson merely informs us, that "the breed of Tibet is large, and of a pale Wolf-like colour," but he only possessed skins of "very young animals;" and this would seem to be the race observed by Moorcroft in his journey to Ladakh (Travels, I, 13), and by him styled "Wolves." One of his party, in advance, disturbed a pack of them in the act of pulling down a Surrow, and having put them to flight, and secured their victim, "the Wolves kept prowling about us, and were not finally dispersed until several shots had been fired at them. They were of a reddish colour, with long, lank bodies, and bushy tails. The natives call them *Khoa*," spelt *Qyo* by Dr. Spry and others, and *Quihoe* in Johnson's 'Indian Field Sports,' referring to the animal of Central

fulvous; of the sides whitish; lead coloured at the base of the hairs. Cheeks, chin, throat, and belly, white. Sides of the chest, inner sides of the legs, yellowish white. Upper part of the legs, and anal region, bright reddish-fulvous. Tail cylindrical, reaching nearly to the ground, pale yellow, with a dark brown tip, and a large tuft of rather rigid hairs (placed over a large gland at its upper part near the base. Ears rather large acute, grey, and edged with black externally; internally, whitish. Length 23½ inches, tail 10 inches. Specimen in British Museum."

From the particular mention of the caudal gland, in addition to the hue of the tail, I am really induced to suspect that this is, after all, no other than the *Vulpes xanthura* above referred to; for of the latter it is mentioned that "in describing this species, Mr. Gray remarked, that it had a large gland, covered with rigid brown hair, on the upper part of the base of its tail, very distinctly marked, and that on looking at the tail of the several other species of this genus, as *V. Bengalensis* [Corsac], *vulgaris*, *fulvus*, and some others, a similar gland was easily recognisable, though it appeared to have been hitherto overlooked." The same may be seen on the tail of a Wolf or Jackal, as must, I should think, be familiar to most observers.

Mr. Gray also described, on the same occasion, a "*Canis procyonides* (Raccoon-faced Dog). Grey-brown, varied with black tips to the hairs. Cheeks and legs dark chocolate-brown. Tail short, thick, pale brown, with white tips to the hairs. Ears rounded, hairy. Length of head 5½ inches; body 17 inches; tail 5 inches. Inhabits China. Specimen in British Museum." This animal is figured in the "Illustrations of Indian Zoology" of Messrs. Hardwicke and Gray, where undoubtedly it is made to look marvellously Raccoon-like.

In the same work is also figured a "Dooab Fox" (*V. rufescens*), but, so far as can be judged from the plates, it would not differ from the ordinary Corsul, unless in the total want of annulation to the fur, which is not very probable.

I republish these notices to aid the investigations of enquirers in this part of the world, and in hope of preventing, as much as possible, a needless multiplication of synonyms.

\* In the latter author's description of the Sumatran wild Dog (*Lin. Trans. XIII, 236*), it is remarked that "the resemblance between this animal and the wild Dog of the Ramghur hills, called *Qmaso*, is strikingly close; the colour of both is the same, the black bushy tail the same, as also the form of the nose; but the ears of the Sumatran Dog are more rounded."

\*



India; terms which, as Colonel H. Smith remarks, "appear to signify imitations of the animal's voice when hunting."

From Herbert's 'Gleanings in Science,' I. 280, I extract the following: "The *Bhowsah* [Buansu] are found in many parts of the hills of North-western India: there are two kinds, one denominated the *Shikárf*, and the other the *Lágh*: the latter is much stouter than the former, and its hair longer and darker; it is not so fleet as the *Shikárf*, but possesses a much finer nose; it quickly regains the scent when lost by the *Shikárf*: it takes the name of *Lagh* from eating the offal of its prey, which the *Shikárf* does not."\*

A "Red Wolf" is mentioned by geographers as inhabiting the Great Altai; and "Wild Dogs," in addition to Wolves, Jackals, and Foxes, are noticed by Elphinstone to occur in Afghanistan. Such an animal is mentioned by Colonel H. Smith, as "the *Beluel* of Avicenna, which that author seems to have considered to be the *Thos* of antiquity. This," continues the learned naturalist cited, "we take to be the *Beluck* of Beloochistan, one of two species of wild canines found in the woody mountains of South-eastern Persia, and probably extending along the high lands West of the Indus into Cabul. It is described as a red wild Dog, very shy, and extremely ferocious, hunting by day in parties of twenty or thirty, seizing a Bullock or Buffalo without hesitation, and tearing the animal to pieces in a few moments. A British Officer, who traversed a part of this wild region of alternate jungle and sandy plateau, deeply scarred into long and parallel furrows, barren and vertical, so that no quadruped can cross many without complete exhaustion, observed a group of these red Dogs lying on the edge of the forest, yet on the watch for game, but they withdrew into cover before he could fire at or completely examine them: they were, however, long and rather low on the legs, of a rufous colour, with a hairy tail and a powerful structure: their foot-marks on the sandy soil were very distinct, and indicated that their feet were exactly like those of a Hound. The native peasants related that they keep aloof from human habitations, and consequently do little injury to human property; but that no animal, especially if it be entangled in the billowy ridges before mentioned, can escape their pursuit. Having demanded some particulars about their structure, they pointed to a domestic Dog then present, and said that the *Beluck* was much like it, but larger and destitute of white colour, which marked the domestic animal; but that there existed, further to the West, a wild species still larger than the red, which had so much white that the brown and black occurred upon its back in the form of spots." The account here given strikingly agrees with that of the Wild Dog of the Rajamahendri district furnished by Major Pew, and appended to Col. Sykes's description of the *Colsun* in *Trans. Roy. As. Soc.* III, 411, so that there can be very little, if any, doubt of their applying to the self-same species, together with the following.

"The Red Wild Dog of Southern China," continues Col. Smith, "is most likely another race or species of this subgenus. It is described as resembling the Dingo of

\* A corresponding distinction is said to obtain among the Wolves of North America. Thus, in Silliman's Journal, VI, 93, we read, of those of the Catskill mountains (a series of ranges extending from the vicinity of the St. Lawrence to the Alleghany ridge), that "Two varieties of Wolves are met with, one called by hunters the Deer Wolf, from his habit of pursuing Deer, for which his light Greyhound form adapts him: the other of a more clumsy figure, with short legs, and large body, more frequently predares upon the flocks under the protection of man."



Australia, though somewhat lower on the legs; but whether this or the Beluch wants the second tubercular tooth, has not been ascertained." *Nat. Libr., Mam.*, IX, 173-5. In the tropical countries eastward of the Boorampooter, it has been generally understood that no wild canine animal exists, as appears to be truly the case with the Jackal; but I have information (and trust to receive specimens) of two species, differing much in size and habits, from the interior of Burmah, besides which I am told that "a Fox resembling that of Bengal, but of a darker colour, and altogether more resembling the English species except in size," inhabits the Siamese hills. "Wolves" are mentioned in Capt. Low's list of the animals of Tenasserim (*Journ. Roy. As. Soc.*, III, 50), "and Wolves, or perhaps wild Dogs," are elsewhere stated by him to inhabit the same range of territory. In Dr. Richardson's 'Mission to the Court of Siam,' (*J. A. S.*, IX, 5), Hares are mentioned,\* "and Wild Dogs are said to be numerous here [near Camboorie], larger, with longer hair than the common Dog, but equally varying in colour." These would seem to be scarcely referrible to the present group.† In Sumatra, we have seen that they exist, and Sir Stamford Raffles alludes to more than one race in Java (*Lin. Trans.* XIII, 249), remarking that how far the Sumatran animal "differs from either of those of Java, Dr. Horsfield will be able to decide." I am unaware, however, that the latter naturalist has published any notice on the subject. Dr. Solomon Muller, if I remember rightly, mentions them by the name of *Canis rutilus*, as alike inhabiting Sumatra, Java, and Borneo (?); and a Java specimen was first taken to Europe by M. Leschenhault, "in size and in proportions equal to a common Wolf, but the ears are smaller; the colour is fulvous-brown, blackish on the back, feet, and tail." Within the Indian Peninsula, the *Colsun* of Sykes, according to Mr. W. Elliot, "was not known in the Southern Mahratta country until of late years. It has now become very common."‡

\* Vide my Report for January, *ante*, p. 102.

† In a notice of some of the animals of the Tenasserim provinces, published in the *Bengal Sporting Magazine* for August, 1841, page 44, we read that — "The Wolf is said by the natives to have been in the country of the Kareans, as also the Wild Dog; but their accounts are not much to be relied on." It is at least probable, however, that wild canine animals of some kind are alluded to.

‡ *Madras Journal*, No. XXIV, 100. I may here cite a very interesting notice of this animal in the 'Madras Journal,' No. XIV, 81: "The animal termed by us the Wild Dog," writes Captain A. Mackintosh, "is known to the natives by the name of *Kollussnah*, *Kollusra*, and *Kollusa*. It is common in the Kotool district, and all along the range of western Ghauts. It is about the size of a Panther [which would be very much larger than any I have seen], with very powerful fore-quarters, narrow tapering loins, black and pointed muzzle, and small erect ears. The tail is long, and at the extremity there is a bunch of hair several inches in length. The *Kollussnah* is of a darkish red colour, possesses great speed, and hunts in packs of five, eight, fifteen, and even to the number of twenty-five; is extremely active, artful, and cunning in mastering its prey. It is during the night-time they move about in search of food; but, should an animal approach near them, an hour or two after sunrise, or a short time before sunset, they will attack it — all animals seem instinctively to dread them. During the day-time, they remain quiet in their hiding-places. When the *Kollussnah* discovers an animal worthy of being captured, the circumstance is announced to the pack by a barking, whistling voice; the others are on the alert, advance rapidly and post themselves slyly round the spot, and gradually close in on the animal. Upon seeing one or two of the *Kollussnahs* he gets frightened, but much more so when, running away at speed, he encounters one of his enemies in whichever direction he attempts to escape. The consequence is, that he stands quite amazed. Some of the *Kollussnahs* run in close to him, and shed water on their bushy tails, which they swing about and jerk into his eyes; he is successively saluted

To sum up, Colonel H. Smith remarks, that—"On reviewing the notices of the present group of Wild Dogs, whether they be one or several species, it is evident that they extend their habitat over an immense surface of Asia; and since they are found to the westward of the Indus, it is likely they inhabit the deep forests along the Caspian, and continuing in the same parallel of latitude, that they have existed and possibly may still be found in the mountains of Asia Minor. If, now, we compare the foregoing descriptions [*Nat. Libr., Mam.*, vol. IX,] with the account of *Λυκος Ξουρος* or *Aureus* of Oppian, which he relates was a resident of the rocky jungles of Mount Amanus and Taurus of Cilicia, a province where he, the poet, naturalist, and sportsman, was born, we cannot suppose that he spoke wholly from hearsay, and ignorant of the characters of his Golden Wolf, mistook it for a Jackal, then not frequent so far to the North; but which in comparison is insignificant, does not fear the heat, nor retires during the appearance of the Dog-star\*; is not of a bright fulvous colour, but greyish in Natolia; is not to be mistaken on account of its howling; burrows in the vicinity of human habitations; is the reverse of a shy and solitary nature; and finally is not noticed by him under another name.† The uncertainty and confusion respecting this group commenced with the ancients, who ranged in all probability not less than three very different canines under the name of *Thoes*. Pliny speaking of a *Thos*, which he viewed as a kind of Wolf, merely remarks, that it had a longer body, shorter legs, sprang with velocity, and lived by hunting; adding, not dangerous to man.‡

in the same manner, when he approaches them, or they run into him. The unlucky beast is soon blinded by the peculiar escharotic quality of the application; for he begins to stagger and reel round and round, and is now beset by all the Kollussnahs who make a loud barking and snapping noise while they pull the animal down and tear it in pieces. When few in number, they have been known to gratify their hunger before the poor animal fell down and expired, each of them tearing away a mouthful while their victim remained standing. There are very few instances of their ever having attacked the villagers' cattle, but they will kill stray calves if they fall in with them. The Kolies never molest the Kollussnah, in fact they are glad to see them in their neighbourhood, being aware of the enmity that exists between them and the Tiger, for they kill that animal occasionally; and in consequence they are considered by the people as the protectors of their cattle and their fields, for neither Sambur, Deer, or Hog, seem disposed to approach places much frequented by the Kollussnah. They hunt and kill the Sambur, Neelgale, Hyæna, Deer, Jackals, Hares, Hogs, Bears, Porcupines, and Quails. They killed a Tiger in June, last year, in the Taloongun jungles."

For a detailed account of the *Buanru* or wild Dog of Nipal, by Mr. Hodgson, vide *As. Res.* XVIII, pt. II, where also are given comparative figures of this animal, the common Indian Fox, and the Jackal. A writer in the Bengal Sporting Magazine, for 1838, p. 404, mentions, that on removing the skin of a "Wild Dog," which he shot near Saugor, "hundreds and hundreds of thorns, of bushes and the spear-grass, were observed lying in the thin membrane between it and the muscles; everywhere, but chiefly in the front part of the fore and hind legs; there was no symptom of inflammation from them, except in two wounds where a little matter had formed: the coat was quite smooth, and there was no vestige of parasites about the animal." The same writer mentions the cry of these creatures when in pursuit of prey, as "the palpable bark of the Dog, but shorter and not so deep, and I thought at the time, as they rushed by me on the right and left, that there was something very angry in the tone of it. Their run was perfectly beautiful, and all together they disappeared, eight in number, over the hill, still preserving the form of a row."

\* *Sirium orientem metuit.*

† Oppian's *Thous* was a spotted animal.

‡ "Luporum genus est (*Thos*) procerius longitudine brevis crurum, dissimile velox saltu venatu vivens innocuum homini." *Pliny*. *Ælian's Thoes* may be Jackals: but the *Thoes* of Homer, described as put to flight by the Lion, while they surrounded the Stag at bay, cannot be Jackals but the *Chryseus*. So also is the *Thos* of Aristotle, when he notices their engaging the Lion.

All these characters are perfectly applicable to the *Chryseus* of our type, and to its varieties. The mistaking of Oppian commenced with Belon; and Kæmpfer, being unacquainted with the existence of the rufous Wild Dog, referred *Aureus* to the Jackal, and misled Linnæus.\*

\* "It is even more likely," continues Col. Smith, "that from this group the mixture with a domestic race might be reported to have been obtained, which the ancients, and even Aristotle, repeatedly assert to be the *Alopecides* or the Chaonian and Spartan breeds, but which, from their strength and courage, could never have resulted from crossing Dogs with Foxes.

"There is some reason to presume that the *Chryseus* formerly existed in Southern Europe: for to what other species can we refer the kind of Wild Dogs noticed by Scaliger, as existing in the woods of Montifalcone in Italy. 'There resided,' he says, 'for ages about Montifalcone, a species of wild Dogs; animals differing from Wolves in manners, voice, and colours; never mixing with them, and being particularly fond of human flesh.' This last character may have been a gratuitous addition of his informants: he does not, in this paragraph, notice the particular colour, but, in another part of the work, wild Dogs of a rufous colour are incidentally recorded. A family of the name of Montifalcone bore a Wolf salient gules; while another of the same name had red Dogs for supporters, in a collection of blazoned Italian arms in the Library of St. Mark at Venice."

I shall now proceed to invite the attention of observers to the following notices by the same indefatigable and learned Zoologist:—

1st.—"With some hesitation we place here the short notice of the *Wak*, a canine designated as a *Dhole*, but possibly a very distinct species. It was first mentioned to us by the late Lieut. Col. Deare, of the 8th Dragoons, who was a native of the East Indies, a keen sportsman, and many years resident in that part of the world. A printed account of a similar animal, observed in captivity, has since appeared in one of the *Annals*: both agree in the description, one having been killed in Central India, the other seen in the Southern Provinces. This *Dhole* was represented to be a robust thick-bodied animal, nearly equal in height to a harrier hound, but heavier in weight; the head broad and ponderous; the forehead flat, with a greater distance from the ears to the eyes than from these to the nose; this was blunt, dark-coloured, and rather broad, the rictus or gape black, opening to beneath the eyes, which were of a greenish-yellow, set in dark eye-lids, and offering a most ferocious aspect; the teeth powerful; the legs and claws remarkably strong, resembling a Bull-Dog's; and the tail rather short, but more bushy towards the end, and sooty in colour: the general colour of the fur tanned, browner on the back, and some white on the breast, belly, and between the limbs. It growled with a deep threatening voice, and the natives related that, in danger, the animal, by means of the tail, flings its urine in the eyes of the pursuers. The Colonel considered this not to be the true *Dhole*, and characterized it as reminding the spectator of a low legged Hyæna with the colour of a Dog; but he was too familiar with the *Hoondar* (or Hyæna) to mistake it for that animal. It was reported to hunt in packs, uttering an occasional deep-toned bay.

2nd.—"The true *Dhole* (*Chryseus Scylax*, H. Smith; *Dhole* of Captain Williamson, and *Quikoe* of Dr. Daniel Johnson). These names here brought in juxta-position, shew how much confusion there exists in designating this and other species among the natives of India; a confusion they extend to Hyænas and Wolves. *Qyo*, *Quikoe* and *Qao*, appear to signify imitations of the animal's voice when hunting; *Dhole*, a Praerit name; but it is evident that where the names of *Hoondar* and *Beriak* (Hyæna and Wolf) are considered synonymous, species still more indistinctly marked may well be expected to be confounded. The *Scylax* is described to be in size between the Wolf and Jackal, slightly made, of a light bay colour, with a sharp face, and fierce keen eyes; in form approaching a Grey-hound; the tail straight, not bushy; the ears wide, pointed, open, and forming a triangle; the skin dark; nose, muzzle, back of the ears, and feet, sooty. From this description the animal differs from *primævus* and the other races, in being more slender and higher on the legs, in having a sharper muzzle, a long close-haired tail, and large dark ears. It is reported to hunt in packs of greater numbers, to utter a cry, while on the scent, resembling the voice of a Fox-hound, intermixed with occasional snarling yelps. Dr. Daniel Johnson witnessed a pack attacking a wild Boar.

"The drawing we possess of *Scylax* was taken from a carefully executed Indian water colour painting, observed in a collection on sale in London, some years before Captain Williamson's 'Oriental Field Sports' was published. Colonel Deare, then a Captain, was about this time in

The Australian Dingo is generally referred to this particular group of Canines, but differs from the rest (if more than one species) hitherto examined, in possessing a second true molar in the lower jaw, wherein the *Colsus* or *Buansu* differs from all others of its natural family (so far as known), wild or tame, with the exception of a Brazilian fossil species recently discovered by Dr. Lund. This character alone supplies an insurmountable objection to the hypothesis of Domestic Dogs having derived from the so called *Canis primævus*.

2. *Canis Lupus*; the Wolf: considered as a peculiar species (*C. pallipes*) by Col. Sykes. Mr. Walter Elliot, however, remarks, that "this species does not appear to differ from the common Wolf. Three young ones which I had alive for some time agreed very well with the description of the *Canis pallipes* of Col. Sykes, but several adults that I shot differed in their colours and general character. The head was large, the muzzle thicker, the colours in some cases more inclining to red, particularly on the fore-legs, which in some cases were deep red; and the same colour was found on the muzzle from the eyes to the nose. Others have more rufous on the hind-legs, together with some black on the thighs, rump, and tip of the tail [European Wolves vary in like manner]. Length from muzzle to insertion of tail thirty-six to thirty-seven inches, ditto of tail sixteen to seventeen inches and a half; height of shoulder twenty-four to twenty-six inches; length of the head ten inches; circumference of ditto, sixteen or seventeen inches; weight of an adult female 42 lbs."

The Wolf appears to be numerous on the open plains of India, but to be generally unknown in the wooded hilly parts. Col. Sykes informs us, that "they are not met with in the woods of the Ghauts" of Dukhun; nor is the species mentioned in Mr. Hodgson's 'Classified Catalogue of the Mammals of Nepâl' (*J. A. S.*, X, 908).<sup>\*</sup> Col.

London, and the copy being shewn him, he first conveyed the information that it represented the *Dhole*, or, as he termed it, the *true Dhole*, distinct in form from the other species already mentioned. In Europe, that name was then only known to a very few persons who had previously resided in India. Specimens occur, it seems, very rarely, and these only in the Rhamghany hills, and sometimes in the Western Ghauts." This may be one of the Himalayan races mentioned by Mr. Ogilby and others.

3rd.—"The *Dhole* of Ceylon (*Canis Ceylonicus*, Shaw). First described by Voormær. This species is evidently much allied to the last mentioned, although the account of it was not taken from an adult. The stuffed specimen was not much larger than a domestic Cat, measuring about twenty-two inches from nose to tail, the tail itself sixteen inches, gradually tapering to a point; the colour yellowish-grey with a cast of brown, owing to some hairs of that colour being longer than the rest; the feet strongly tinged with brown; the hair close but soft to the touch; the head long and pointed; the snout and under chin brown, but the top of the head yellowish-ash colour, which, passing beyond the ears, forms a spot below them and terminates in a point below the eyes; the ears were small, elevated, and pointed. In this specimen, the last molar of the lower jaw was also wanting [from immaturity?] The claws resembled those of a Cat more than of a Dog, and there were five toes on the hind as well as on the fore feet. We have examined, in Holland, the skin of a Dog which was said to have come from Ceylon, and corresponded sufficiently to admit of its being the same species, although it was at least four inches longer, and the colours were less grey and more fulvous; the tail was long and without a bush, and the claws blunt, but with five on each foot. It is evident that the discrepancies between the two were owing to none in Boddart's specimen. The skull we have not seen."

All these notices require exceedingly to be verified upon examination of specimens.

\* "The common Wolf is numerous in the plains, but I have never seen or even heard of them in the Himalaya.

"The Jackal is rare there, and I have never met with them but in the low and warm valleys."—*The Rev. R. Everest on the power of enduring cold in the Mammalia of Hot Countries.*—*Mag. Nat. Hist.*, January, 1842.

Smith seems to believe in the existence of a smaller race, "lower, with a broader back, and of a light grey colour, obscurely marked with darker cross bars, from the tips of the hairs being black; the limbs and face pale buff. A specimen, shot among the rocks on the sea-shore, near Vincovah, in the vicinity of Bombay, was in colour yellowish-grey, brindled with blackish streaks: the head was sharp: the under-parts dirty-white; the tail not very hairy, whitish below, and the markings on the body distinct. It was killed in the act of searching for offal and putrid animal matter cast on shore by the sea."\*

3. *C. aureus*; the Jackal. Common to all India westward of the Boorampooter, and extending (without satisfactorily known variation) to Anatolia, Turkey, the Island of Candia, part of Greece, and the southernmost confines of Russia; but, I believe, unknown in Africa, where represented by allied species. Syria and the north-east of Africa are, indeed, remarkable for the variety of small indigenous canines described by Ruppell and by Hemprich and Ehrenberg; and the following has, probably, still to be added to their number (vide Kotzebue's 'Journey to Persia', p. 62). "In Grusia, among the beasts of prey, there is a species of Jackal which is called *Tshakatka*. It resembles the Wolf, but is smaller and has a much more ferocious appearance; its howl shakes the very soul. The animal is, besides, very bold, and sneaks during the night into the camp to steal the soldiers' boots. When very hungry, it enters burial grounds and digs up the bodies recently interred." It is thus a true Jackal, but there is reason to suspect a larger species than the common one.

4. *C. chrysurus*, Gray, vel (?) *Vulpes xanthura*, Gray, already noticed.

5. *Vulpes Corsac*, v. *Bengalensis*, *Indicus*, et *Kokree*. Mr. Elliot states of this species, that "it is remarkable that though the brush is generally tipped with black, a white one is occasionally found [i. e. in the Southern Mahratta country], while in other parts of India, as in Cutch, the tip is always white." In Bengal I have hitherto found it invariably black-tipped. This animal appears to be common throughout India, extending, it would seem, westward of the Indus and into Tartary. The varieties(?) mentioned by Elphinstone, as already cited, inhabiting the Western Indian desert, require investigation; as also the Dooab Fox of Hardwicke and Gray.

6. *V. montanus*, vel *Himalaicus*, vel ? *Nipalensis* et *Hodgsonii* of Gray, the latter probably mere varieties of colour, and not more different from the ordinary type than the beautiful specimen exhibited on this occasion. The Neilgherry Fox is, probably, an additional species, unless it prove to be Mr. Gray's *Chrysurus* vel? *Xanthura* which however is unlikely.

From Mr. J. J. Athanass, have been received ten heads of the Indian Antelope (*Antilope Cervicapra*), one only being that of a female, and among those of males there is one remarkable for the deformity of its right horn, which curves shortly round to form a circle and is then broken off: this horn indeed considerably resembles that of a castrated individual which lived some years in the London Zoological Gardens, and which possessed a horn on one side only, of similar flexure, the other side having no more trace of it than in the female of this species; and it may be, therefore, that the testis of the corresponding side had been injured in the animal whose head is now exhibited, a circumstance which, in the Cervine genus, is well known to affect the

\* Communicated to Col. Smith by Col. Dunsterville, H. C. S., who was present.

development of the antler of that side; and a very curious circumstance is related (*Lin. Trans.* II, 356,) of a female *Cervus Elaphus*, "which had one horn perfectly similar to that of a Stag three years old. It never had a horn on the other side of its head, for there the corresponding place was covered over by the skin, and quite smooth. It did not seem to have ever produced a fawn, and upon dissection, the osseum on the same side with the horn, was found to be schirrous." The true facts relative to the development of antlers in castrated Deer, as observed in a number annually gelded in the Royal demesne of Richmond Park, do not appear to be generally known: the antlers which the animal had borne at the time of the operation are shed in due season, though later than in the perfect animals, and they are regularly succeeded by others which never fall, nor cease growing from time to time, slowly and weakly, and shooting forth most irregularly with regard to shape, the velvet, or hairy skin investing them, being, under these circumstances, of course permanent; though (at least in some groups) it appears that where this animal is emasculated while young, the antlers do not appear at all, as instanced by a "heaver" or ox Sambur (*C. Hippelaphus*,) whose skeleton is in the Museum of this Society. The currently received doctrine on this subject is still that of Buffon (*Hist. Nat.* VI, 81), who asserts "Si l'on fait cette opération dans le temps qu'il a mis bas sa tête, il ne s'en forme pas une nouvelle; et si on ne la fait au contraire que dans le temps qu'il a refait sa tête, elle ne tombe plus, l'animal en un mot reste pour tout la vie dans l'état on il étoit lorsqu'il a subi la castration," which appears to be taken for granted by all subsequent writers.\* I may take this opportunity, too, to remark that in the park surrounding Government House, at Madras, there is a very large herd of Indian Antelopes, being the posterity of a single tame pair. The gentleness and familiarity of these beautiful creatures surprised me considerably, knowing how dangerous a solitary tame one is apt to be, particularly when its range is limited; but I learned that not a single accident had ever happened in the present instance, though the bucks are commonly heard groaning and fighting at nights. As I drove past them, they were lying and grazing on each side as quietly as Sheep, and now and then two or three would be seen skipping after each other, more lightly than Fallow Deer, which latter they much resembled in their trot. Among the whole large herd, I observed but a single coal-black male, though very many had fully developed horns; nor is more than one such ever seen. I believe, in the wild herds, however extensive, the rest being driven off as they attain complete maturity.

*Gazella cora*, H. Smith (vide page 452, ante); seven heads, including two of females.

*Cervus Axis*: two heads.

*Gavius Gangeticus*: a large stuffed specimen, and the head of a smaller one.

From — Hamilton, Esq. C. S., of Mirzapore,

*Hyæna vulgaris* v. *virgata*: skin and skeleton. The former has, with considerable patience and difficulty, been mounted, and now forms a very tolerable stuffed specimen.

From G. Hugon, Esq. two frontlets of Deer, from the Mauritius. What this Deer is, if described at all, I do not know, though I have long been acquainted with the

\* For the above interesting piece of information relative to the *heavers* of Richmond Park, I am indebted to the celebrated animal painter, Mr. Hill, who shewed me a number of specimens illustrative of the fact.—E. B.

skull and antlers of the species, of which there is a fine specimen in the London United Service Museum, and a frontlet in the private collection of Mr. Hill: there was also previously an example of the skull of this animal in the Museum of this Society. In *Proc. Zool. Soc.*, for 1831, 45, the late M. Desjardins enumerates *Cervus Elaphus* in his Catalogue of Mauritius animals, which, if referring to the present species, as must be supposed, is a strange error. Duvaux, in his 'Letters from the Mauritius' (p. 295), remarks, that "the Stags [of that island] are much smaller, and of a greyer colour, than those of Europe, and are supposed to have been introduced by the Portuguese." A friend who has hunted them can merely inform me that they have a remarkably shaggy coat, but at once recognized the Society's former specimen above alluded to as belonging to the species. The antlers are proportionably large, and might be mistaken by even a practised eye for those of the Sambur (*C. Hippelaphus*); but the skull is considerably smaller than in that animal, and accordingly the antlers are nearer together at base: in every specimen which I have seen, the inner tine of the terminal fork is very much longer than the outer one, being the reverse of what obtains in the common Spotted Axis, while in the Sambur and Jerrow, although this character is variable, the relative proportion is generally as in the present species, but to a less extent. In size the skull in the United Service Museum is larger than that which we possess, measuring (according to my notes) thirteen inches in total length, or from occipital ridge to the tip of *nasals*, over the curves, twelve inches; orbits apart posteriorly five inches, anteriorly four inches and a quarter; palate five inches, and two inches wide posteriorly. The pedicles of the antlers are one inch long, measuring on the inside, and those of the three frontlets before me are equally elongated, although the antlers are of full dimensions; the latter measuring, in the London specimen, thirty inches long, six inches and a half round above burr, and four inches and three quarters in the beam; the corresponding measurements, in the three specimens before me, being thirty, seven, and four and a half inches,—twenty-eight, seven and a quarter, and four and a half inches,—and twenty-eight, six, and four inches: they have the set and general form of those of the Sambur and Axis, and not (as in *C. equinus*, *Molluccensis*, and some other large Malayan species,) that of the common Hog Deer; and their granulated surface likewise resembles that of the Sambur's antlers. The skull in the Society's collection has its intermaxillaries imperfect, and the occiput is also incomplete; but from base of pedicle to tip of *nasals* it measures but eight inches and one-eighth, the greatest width of orbits apart posteriorly five inches, and anteriorly three inches and three-quarters, length of bony palate four inches and five-eighths, and width posteriorly two inches: there are the sockets of two small canines, but all the teeth are lost. Further information respecting, and especially specimens of, this animal are desirable, and there can be little or no doubt that it was originally imported from some part of the Malayan Archipelago.

From Captain Ommanay, has been received a specimen of

*Eurylaimus nasutus*, v. *Todus nasutus*, Gmelin, *Cymbirynchus nasutus*, Vigors, and *Eur. lemniscatus*, Raffles.

From Robert Ince, Esq., Supt. of Salt Chokees, Zillah Backergunge, a specimen of a timber-perforating Worm, accompanied with the following particulars:—"Specimen of the Worm which destroys boats or timber while floating in the rivers of the eastern district of Bengal, more particularly in and near Backergunge and Furreed-



pore. This creature perforates the wood, leaving a mucilaginous deposit which hardens into a shelly substance. It is only found during the hot months, and is termed by the natives *Noona Kheen* ("Salt Worm"), as it is believed to be never met with out of brackish water, i. e. beyond the influence of the tides during the S. W. monsoon. Soondree wood is particularly liable to its attacks. The natives destroy the creature by hauling their boats ashore, and burning stubble beneath them."

This Worm combines the general form of *Nereis* with distinct eyes as in *Phyllodyce*, and is therefore inadmissible into any of the described genera with which I am acquainted. As in the former, its proboscis is furnished with a single pair of strong serrated mandibles or nippers, and there are three minute tentacles on each side posterior to its base; beside which, over the inner margin of each eye, is a rudimental *antenna* existing as a small tubercle. The rings of the body are very numerous, and are each furnished (as in *Nereis*,) with a branchial lamina, but having only one minute tubercle and small packet of bristles beneath. Length eight inches and a half, and present colour of specimen livid-white, becoming dark purplish towards the head; the proboscis white, and jaws horny-black. The natural colour is mentioned by Mr. Ince to be flesh-red. I shall designate it *Lignicola destructor*. Mr. Ince has promised a specimen of the timber perforated by it, and the Worm now presented to the Society was taken out of the bottom of the Chokee boat attached to the Superintendent's office of Backergunge.\*

To the zoologist it will convey no information to be told that this and analogous species merely bore for a habitation, a fact sufficiently implied by the existence of visual organs in the specimen now exhibited, which would intimate that it watched for its prey at the entrance of its hole, as various allied genera are known to feel for it with their tentacles, these being, in the *Lignicola*, too minute to be of much efficacy for the purpose.

The specimens of *Vertebrata* procured in the neighbourhood during the past month have not been generally of much interest, owing to the impossibility of myself devoting any time to collecting, and the incorrigible worthlessness of the native Shikarees, by whose agency I have hitherto endeavoured to procure specimens. The most worthy of notice is an example of *Megaderma lyra*, which I myself took in the act of preying upon another Bat, the interesting circumstances connected therewith have been described in an article now printing for the Society's Journal.† Another speci-

\* The specimen of perforated wood here adverted to has since been received, being completely honey-combed all over, the ravages of the Worm producing much the same appearance as those of the *Teredo navalis*.

† Vide page 255 *ante*. I have since made a capture of eight specimens of this Bat, from an assemblage of thirty or forty, (and I can procure others of these when I please), that pass the day hanging to the roof of a long roomy out-house, selecting a not very dark situation (as the *Rhinolophi* are said to do), though when disturbed they rarely attempt to escape by the open windows, being evidently much more incommoded by bright day-light than the restricted *Vespertilioncs*, and when they do so pass out very soon settling upon any tree near at hand, and suffering themselves to be taken by an insect-net. Of these eight adult specimens, only two were males, intimating, however, that the sexes do not assemble separately, as is the case with various other Bats, while it is pretty clear that the females much exceed the males in number. The *Pteropodes* are also stated to herd in separate flocks, the males apart from the females, which I doubt; but here, again, it would seem that the females are much more numerous than the males, for of twelve specimens



men of *Pachysoma marginatum* has also been obtained, which had contrived to drown itself in a vessel of water in the Society's compound, and is at present prepared as a skeleton.

In the class of Birds, the mass of small waders are now in beautiful summer plumage, and as fast as we can obtain specimens uninjured by the ruthless hands of the native dealers in the bazaar, they are secured for the Museum, or to be set aside for exchanges; but it is most provoking to observe the numbers of fine specimens, which despite all that can be said and reiterated to these people *ad nauseam*, the stolid savages persist in partially stripping of their feathers, or otherwise injuring so as to render them quite unfit for preservation; in illustration of which it will be enough to mention that out of the many hundreds of common Curlews (*Numenius arquata*) which have been brought to the bazaar in the course of the season, I have not yet been able to furnish the Museum with examples of this abundant species.

There is a curious fact relating to the changes of plumage in these birds, which I do not think has ever been distinctly stated: viz. that whilst they actually change their plumage, by renewal of the feathers, to a greater or less extent, the changes of colour are independent of the renovation of the feathers; thus the old feathers, prior to being shed, will be seen to have acquired more or less of the hue of the new ones which replace them; and these, in their turn, soon after the bird has bred, and long before the autumnal moult, gradually lose the hue which distinguishes the nuptial livery;\* the latter is particularly exemplified by *Totanus fuscus*, wherein the deep sooty hue which imbues even the legs, in addition to the entire plumage, of this bird in nuptial garb (as illustrated by specimens now exhibited,) disappears totally after breeding in the same feathers, as I have witnessed in every stage of this absorption of colouring matter, so that the bird resumes very nearly the aspect of its winter uniform. It may further be observed, that, at the vernal moult, the amount of renovation of the feathers, and the period at which this takes place, are both very irregular, depending on the constitutional vigour of the individual; some weakly birds, both young and adults, the latter probably such as are past breeding, or otherwise sexually debilitated, undergoing little or no change even of colouring. It is also a remarkable fact, that when a bird drops its feathers at the regular moulting period, it sheds them alike whether new or old, even such as had grown in place of others that had been accidentally pulled out but a few weeks previously; while, if from debility or any other cause, as sometimes happens in a specimen newly caught and caged, the feathers do not fall at the proper season, they then remain till the next ordinary moulting period, however distant, i. e. for another year in what are termed "single moulting" species.

*Circus Swainsonii*, A. Smith, v. *pallidus* of Sykes, female.

*Emberiza fucata*†? Pallas, Shaw's 'Zoology' IX, 385: described as "common on the rivers Onon and Trigodia, in Russia." A bird answering to the brief description by Shaw, is plentiful in the neighbourhood of Calcutta, to judge from its being

passing over which I lately brought down, I could only get a single male. Collecting so many has enabled me to decide, that the specimen noticed in Vol. X, p. 840, does not differ specifically from the *Ph. Edwardsii* vel *medius*, Auctorum.

\* I have even observed that, not unfrequently, the new feathers put forth at the vernal moult are only partially of the colour they afterwards assume.—E. B.

† Identified by Mr. Jerdon with his doubtfully cited *E. cia*. *Madr. Jl.* No. XXVI, 29.—E. B.

frequently brought for sale in the medley of species purchased as "Ortolans" by Europeans. I have long waited for uninjured specimens, and now exhibit two males and a female that at least have one side perfect. Size of the Cirl Bunting, and allied to this species in form. Length six inches, by nearly ten inches across; wing two inches and seven-eighths, and middle tail-feathers two inches and a half, the external rather more; bill to forehead (through the feathers) above half an inch, and the same to gape; tarse seven-eighths of an inch: head, with the back and sides of the neck, dark grey, having a black medial streak to each feather, most developed on those of the crown; ear-coverts forming a conspicuous deep rufous spot; shoulders of the wings, scapularies, and rump, the same but not so dark, also a band crossing the lower part of the breast, more or less developed; inter-scapularies or dorsal feathers resembling those of a male common House Sparrow; throat, fore-neck, and breast, to the rufous band, whitish or slightly yellowish-white, with a narrow black streak commencing at each corner of the lower mandible, widening or spreading as it descends, and then branching to form a gorget with its opposite, being more or less developed in different specimens; the sides of the breast, below this gorget are purer white, and the belly, below the rufous band, is tinged with fulvous; a light streak over the eye; wings dusky within, the feathers edged externally with rufous and fulvous, and the outermost tail-feather obliquely marked with white, the next but slightly so. Irides dark. Bill (at this season) dusky above, lighter on parts of the lower mandible; and feet pale brown with a slight livid cast. The female merely differs in being rather smaller with the colours less bright.

The only other Indian species we possess of this genus appears to have been several times described, firstly by Mr. Vigors, (*P. Z. S.* 1831, 183,) as *E. cristata*, then by Messrs. Jardine and Selby, (*Ill. Orn.* pl. CXXXII,) as *E. erythropterus*, and lastly by Mr. Hodgson, (*As. Res.* XIX, 157,) as *E. Nipalensis*: at least our specimens agree alike with all the descriptions here cited; and I even incline to doubt whether the *E. subcristata* of Col. Sykes, (*P. Z. S.* 1832, 93,) be aught else than the female, which opinion he indeed combats, albeit there would appear to be certain differences, to judge from his description.\*

I have also obtained two curious small marsh birds in the bazaar, which are not easy to classify; being referriable, indeed, to an extensive group allied to the *Salicariæ*, to the *Priniæ*, and to that African subdivision formerly included in *Malarus*, and which group has not been, that I am aware of, duly studied in all its diversified ramifications. The first, however, I shall provisionally arrange as

*Dasyornis? locustelloides*, from the near resemblance which it bears in plumage to the Locustelle, or Grasshopper-bird, (*Locustella Raii*,) of the British Islands.† In form it appears to be closely allied to the *D. Australis* of Messrs. Jardine and Selby, figured in the "Illustrations of Ornithology," pl. LXXIII; but, on actual comparison, will probably prove separable as a minimum subdivision. Length seven inches, by nine inches in extent of wing, the latter from bend two inches and seven-eighths, and medial tail-feathers eight inches; bill to forehead (through the feathers) five-eighths of an inch, and nearly seven-eighths of an inch to gape; tarse an inch and one-sixteenth: the bill is strong, three-sixteenths of an inch deep, and compressed laterally,

\* The Society has since received *E. citreola* from Mr. Hodgson.

† It is, I now find, the *Megalurus? striatus* of Mr. Jerdon's Supplement, a single specimen having been procured by that naturalist on the Neilghierries.

but otherwise resembles that of the *Salicariæ*, and between the rictus and eye are five remarkably strong bristles, forming an almost vertical range, with a small bare space in front of them, and they are curved stiffly outwards, as if the object were to defend the eyes; there are likewise small setæ at the base of the lower mandible: the wings and tail have also the true character stated of *Dasyornis*, as well as (it would appear) the feet. General colour olive-brown, with mesial blackish streaks to the feathers; the throat and belly white, and breast and flanks light brown, the breast having a few traces of darker specks: tail graduated, each feather tipped with fulvous-white, and the rest dusky along the centres, and brownish barred with dusky externally. Irides dark greyish olive. Bill dark olive-brown above, beneath paler; and legs light purplish-brown. The specimen described was a female.\*

The other species is considerably superior in size, with proportionally much larger and stouter legs, a straight and slender bill, and long, somewhat sharp-pointed tail, the feathers of which are exceedingly graduated; rictorial bristles small and inconspicuous. Its genus would seem to be *Megalurus*, and the specimen has unfortunately its wings and tail so much mutilated by the bazaar people, that I shall not offer a further description. A curious feature consisted in the inside of the mouth being wholly blackish, while the bill was of a livid colour suffused above with blackish, which is probably a seasonal distinction.

*Cryptonyx coronatus*: recent female, from Singapore, presented by myself.

The magnificent specimen of the Himalayan Lammergeyer (*Gypætos*), exhibited at the last Meeting of the Society, has been mounted, together with some other skins, and more are now in progress of being set up.

Recurring to the class of Mammalia, I noticed, in a previous Report (*ante*, pp. 95-8 & seq.), the existence of three species of Otter in the Hooghly, in addition to a Darjeeling species there also described; and I may now announce the existence of a fourth species in the Hooghly, or at least which I infer to have been thence obtained, since our Museum contains two specimens of the skull, marked "common Otter," and which from their size I had hitherto referred to *Lutra leptonyx*. Upon recently, however, having had the skulls of *L. leptonyx* and *L. nair* taken out from the skins and cleaned, it became at once apparent that the species previously referred to the former was quite distinct, the skulls differing in being very much more compressed between the orbits, in the still inferior size although the age is greater, in the further development of the post-orbital processes in both specimens, and a variety of

\* I have since obtained another species of the same minimum group, but so wretchedly mutilated by the bazar shikaree who caught it, and also smeared with bird-lime, that I can hardly venture upon a description. Not content with plucking out the large feathers of one wing and of the tail, the cruel brute had broken its lower mandible to prevent its biting, as is the custom of these people with Cormorants, Herons, and such other birds whose peck is worthy of some precaution to avoid: otherwise I think I might have kept it for a while alive. It is considerably larger than *D. locusteloides*, (*striatus*), with legs proportionably larger, and the beak much less compressed laterally. Plumage very like that of the other, but a well developed whitish streak over the eye, the brown a shade less fulvous, and the blackish mesial streak to each coronal feather less defined and contrasting. Irides dusky olive: bill and inside of the mouth wholly blackish: and legs dull purplish-brown. Length, to base of tail, four inches and five-eighths, of wing three inches and a half, and tarse one inch and a quarter; bill to forehead (through the feathers) nine-sixteenths of an inch, and to gape, (which is armed with five strong outward-curved setæ, as in the other,) one inch and three-fourths. I shall provisionally designate this species *D. colluriceps*.—E. B.

minor particulars. The difficulty of procuring specimens of these animals in this neighbourhood, however numerous they may be, is much greater than would be supposed, from the doltish apathy of the shikarees, who cannot be induced to deviate from their beaten path of procuring esculent creatures only; and it may yet be a long while, therefore, before I succeed in procuring the materials for describing the species which I have here merely indicated.

A specimen of a Remora, or Sucking-fish, (*Echeneis naucrates*,) has been purchased in the bazaar.

My principal occupation has, however, been lately in arranging our shells, and especially our insects. Of the latter we possess, firstly, the specimens in the cases (including many from Assam and Sylhet), which were either merely arranged according to their localities, or not arranged at all; the former method possessing some advantages, but involving great inconvenience for room, and most unnecessary successions of duplicates of the generally predominant species: secondly, the box of Swan River specimens presented by Mr. Crichton, as noticed in my report for last September: thirdly, those from Afghanistan mentioned in my last report: fourthly, a considerable number that have been taken under my own superintendence in this neighbourhood: and fifthly, a large box of specimens, chiefly *Coleoptera* and *Hemiptera*, thrown loosely upon one another, and consequently, for the most part, much injured, which were presented to the Society by Dr. O'Shaughnessy, and which I suspect (from the prevalence of certain species) to have been from Sylhet or Assam, probably the latter. Many interesting *Curculionidae* and other hard-cased *Coleoptera* have been picked uninjured out of this lot, and altogether many hundred specimens have been rescued from impending destruction, affording a considerable number of duplicates of some of them, which are of essential service, as supplying the means of getting satisfactorily identified such as have already received names.

A package of various skins, chiefly of birds, has been shipped for the *Collegium Academicum* of Christiana; another to the Cornish institution at Truro, through Dr. Spry; and a third box of specimens has been forwarded to Mr. Jerdon at Madras, from whom, in return, we may expect, shortly, a consignment of valuable specimens from Peninsular India, whitherfrom at present our Museum can boast very few contributions in recent Zoology.\*

I remain, Sir,

With much respect,

Your's obediently,

EDWARD BLYTH.

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\* Mr. Jerdon's valuable donation has since been received.

*Museum of Economic Geology.*

Read report of the Curator in this Department for the Month of May last.

*Report of the Curator Museum Economic Geology for the month of May.*

*Museum Economic Geology.*—The Memoir alluded to in my last report, explaining briefly the object and wants of the institution, and soliciting contributions has been with the approbation of the Honourable the President and Secretary, printed, and is now on the table. It will be circulated as widely as possible in all the Presidencies, and in Europe, so as to insure us every chance of assistance.

I have resumed the arrangement of the Museum, and hope to get through with it, and the Catalogues shortly.

We are indebted to Mr. Hodgson of Nepal, for a small collection of iron, copper, and lead ores from Nepal, of which one or two are new to the Museum, and all valuable as contributing to our Indian series.\*

*Geological and Mineralogical.*—We have at length to announce the arrival from Kemaon of three, out of five volumes of Captain Herbert's Journals, the remaining two being for the present with Mr. Batten, as explained in his letter.

Upon examining these volumes with reference to the collection in our cabinets, I find they relate first to from numbers 1 to about 375, then from 1 to 379 of the second thousand, and lastly from 1563 to 1612, leaving thus a blank of about 800 names and localities, which I doubt not, or at least I hope, will be found in the other books.

From a cursory examination of these volumes, I will venture to congratulate the Society very sincerely upon the amount of Geological and Mineralogical knowledge, which we have thus, I hope, obtained the means of giving to the world; (if we can but connect Captain Herbert's complicated systems of numbers,) and his friends upon the justice which these volumes will I trust enable us to do to his memory.

Major Manson who was Captain Herbert's Assistant, has been written to, to obtain any assistance which he can give us. We have received in this Department seven specimens (Geological) from Mr. H. Stanley. And I have been chiefly occupied in part with Captain Herbert's collections, and in part with our own Geological series.

H. PIDDINGTON.

*Museum, 31st May, 1842.*

Read letter from Mr. Secretary BUSHBY of the 2nd February 1842, forwarding a box of specimens of Magnetic Iron Ore, from Tavoy, Sulphuret of Antimony from the neighbourhood of Moulmein, and of the Mergui coal received from Captain TREMENER.

An interesting Chart of the Barometrical curve, during the late storm, was exhibited to the Meeting by Mr. Piddington, who explained that he was in hopes of obtaining through the data he looked for from this storm, a Barometrical *measure* of the distance

\* I have to mention also, that permission has been obtained from Government to indent upon the Honorable Company's Dispensary, for such re-agents and apparatus as it may possess, which will be required for the Laboratory of the Museum.

of the centre of a hurricane; which conjointly with the method of estimating the distance by mathematical projection, as given in his "Notes on the Law of Storms," published by Government for the use of the China Expedition, would enable the seaman to estimate pretty correctly his distance from the centres, and thus guide his judgment as to the best course to pursue.

For these presentations and contributions the thanks of the Society were accorded.

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# EXTRA NUMBER.

[Issued gratis to Members of the Society, and to Subscribers to the Journal.]

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## JOURNAL

OF THE

## ASIATIC SOCIETY.

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*Report of the Mineralogical Survey of the Himmalaya Mountains lying between the Rivers Sutlej and Kalee. Illustrated by a Geological Map,\*  
By Captain J. D. HERBERT, Superintendent.*

To some of our Indian, and to many of our European readers, it may be necessary to explain the circumstances which gave rise to the following report, and those under which it has so long remained unpublished.

Captain Herbert of the Bengal Infantry, Deputy Surveyor General of Bengal, and Superintendent of Kemaon Surveys, was appointed by the Government of India, then under the Marquis of Hastings, to undertake a Mineralogical Survey of that part of the Himalya Mountains, which form the British Frontier to the North-West; but it would appear that this was not fully executed, though much was done; and the elements of much more which might have been accomplished at a small expence were already collected.

Captain Herbert, after editing for three years the valuable Gleanings in Science, the parent of our Journal, was appointed Astronomer to the King of Oude, whither he proceeded, but enjoyed for a very short time his post, dying of an apoplectic attack in 1833.

When our present, Curator of the Museum of Economic Geology, Mr. Piddington, assumed temporary charge of the Museum, he found 12 cases filled with what were well known by the Assistants to be "Captain Herbert's specimens," but beyond this fact, not a line of Catalogue, Journal, or Note relating to the specimens could be discovered; It became then an object of great importance to the Society, and to Science, to trace out, if possible, any records which could throw light upon this valuable collection, and after a persevering search of eighteen months by the Secretary and himself, their labour was rewarded, first by the discovery of five volumes of Captain Herbert's Notes, which had been carried into KEMAON! but fortunately left there in the care of a zealous friend to Science, and a valuable associate of the So-

\* See Introductory Remarks.

ciety, Mr. J. H. Batten of the Civil Service; next, by that of the report now published (to which Captain Herbert's paper on the Mineral Resources of the Himalaya in the Physical Transactions, Vol. XVIII. is a sequel,) and through the report, by the knowledge that his geological map, and plans of the river basins of that part of the Himalaya, exist in the records of the India House. It is needless to add, that no time has been lost in requesting copies of these valuable documents from home.

It remains but to add a word on the lacunæ which it will be perceived occur so frequently in the first pages of the MSS. These are owing to some corrosive liquid having so far destroyed the manuscript that it has been sometimes necessary to fill it up altogether conjecturally, but at other places there are enough of words or letters left to assure us, that we were not far from the very words used by Captain Herbert. It will be noted, that all our emendations are distinguished both by italics and by brackets.

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## INTRODUCTION.

1. It has been my intention to give, in the accompanying paper, such a general sketch of the geological features of the mountain tract between the Kalee and the Sutlej Rivers, as the series of partial and scattered observations which I have yet been able to make will allow. In the absence of every thing like information, such a sketch, though necessarily imperfect, and even premature, will not be perhaps without interest. It will at least serve to exhibit to the Government, who have so favorably distinguished me, the nature and extent of my labours since entering on this duty, and also to mark out the train of investigation which they have suggested to me.

As such I offer it, but with diffidence. Geology, as a science, has not yet attracted in India that attention which its importance merits, and it would be futile in me to deny that, till selected for this duty, I had but a slender acquaintance with the subject. While exploring the local phenomena of this tract I have been in reality studying the principles of the science; an advantage in so far as I may hope to have escaped the trammels of system. But on this account I have also laboured under some disadvantages, inasmuch as a premature account like the present, of an unfinished survey, may be expected to lie under some imperfections, which a little more technical knowledge on my part might perhaps have removed. "But a survey that shall accomplish every thing, must be a work of time, nor will any thing be contributed towards it by



him, who fearful of being wrong where as yet it is impossible to be always right, and unsatisfied with the best he is able to attain, delays the record of his observations to the period of perfection." Should it be considered as redeeming in any degree the pledge of industry and zeal, which my acceptance of such an appointment must have held out, I shall consider its chief end answered.

3. Hereafter, when a more enlarged field of observation shall be attained, I trust I shall be able to make it more worthy the attention of the scientific geologist. Having once put on record what has been done, and digested it into something like a regular form, it will be easy to add to it as my researches extend and become more particular. One part will throw light on another. A particular fact carefully observed, may sometimes lead to a happy generalisation, and in this way many deficiencies will I hope be supplied which must necessarily attend so early an effort. In the meantime, imperfect as it is, this paper will have its uses. By exhibiting what has been done, it will shew what remains to do, and it will serve as a guide to direct any future labours, by pointing out in what quarter interesting facts may, or may not be expected to occur.

4. Considered as a geological description of these mountains, many blanks will be observed. For besides that, it was impossible in so short a time to go over every part of them, there is a difficulty peculiar to this quarter which very much interferes with geological investigation. This is the total absence of every kind of excavation, calculated to afford information, whether mines, roads, or quarries. The former, few as they are, are inaccessible to any but those accustomed to them from their infancy. The total length of roads as yet laid open, does not much exceed 150 miles, and such is the light thrown on the subject along the different lines as to render it still more a matter of regret that we have not greater access in this way to the actual rocks, the nature of which is often only to be guessed at. Of quarries there are absolutely none, for the province, though possessing excellent limestone, slate, and other productions, capable of being turned to account, had been, up to the period of our conquest, so wretchedly misgoverned, as to have occasioned resources of this kind to lie utterly neglected. From the consequent difficulty of determining in many cases the nature or relations of the rocks, some particulars have necessarily been taken

for granted without actual examination, which in this case would have been impossible.

5. In the Geological Map I have laid down much that has not been actually examined, as might be concluded from what I have stated in my letter to Government, paragraph 7. To refuse to employ those generalisations which the experience of all geologists has shewn to be well-founded, is to forfeit the advantages derivable from the labours of our predecessors, and to impose on ourselves the task of reconstructing the whole science from our own materials. When the same rock has been found on the line of direction in every point in which it has been examined I have deemed myself justified in laying down that rock as continuous through those points. Even at the termination of the survey, many conclusions of this nature must be taken for granted; for it has been well observed, that "no human patience would suffice for the examination of every piece of rock that projects through the surface." And, even were that effected, still much must be taken for granted, especially in these mountains, the rocks being concealed, as they so often are, by deep collections of debris, and covered by luxuriant coats of vegetation. I was, however, in a very early stage of the survey, taught to except from this conclusion granite, as being a rock the occurrence or non-occurrence of which in any particular spot I found I could never predict with any certainty. Limestone also I found seldom could be depended on for any distance, forming always beds in other rocks, and never appearing under those relations which I conceive necessary to constitute a principal [*formation.*]

6. The elevations expressed in the sections,\* have been determined by barometrical measurement, a method which unless under favorable circumstances, and with great facilities [*is liable to error, but*] the degree of accuracy attained is sufficient for the purpose, as it is a matter of no importance whatever whether the place of a rock be assigned fifty feet below, or above, its real level. They are as correct I believe as geological sections ever are, and certainly sufficiently correct to answer all the purposes for which they are required. The fixed points determined by the Trigonometrical Survey have been always

\* I regret that the circumstances under which this report has been prepared, have prevented the preparation of these. They are, however, more than half finished, and shall be forwarded with as little delay as possible.

used when they fell in the line, and they have not unfrequently been found of value as terms of comparison by which to judge of the accuracy of the barometrical results.

[*The nomenclature adopted, is that of MacCulloch's*] Hebrides. It were no doubt very much to be desired, that a system of nomenclature founded altogether on mineralogical distinctions, (like Brogniart's for instance,) should be generally received by geologists. It would save much useless and cumbrous description. Till such a reform, however, be introduced, the safest plan is to follow the example given in the above work, of noticing and describing correctly every compound included under any general head or term, as constituting a distinct geological formation. By this means the danger of confusion is entirely obviated.

Silt, sand, gravel, or boulder stones which are evidently derived from the breaking up of pre-existing rocks, and are of the latest formation, are all comprehended by Dr. MacCulloch, under the term "alluvium of transport." Professor Buckland was, I believe, the first to establish in a satisfactory manner, that there are deposits which may be discriminated as originating in two distinct causes, either in the action of the present rivers of the globe, or of a mighty rush of waters or deluge, far surpassing the greatest effect of rivers as they exist at present even in their highest floods. To the former, the term alluvium is restricted. The [*latter he distinguishes by the term diluvium, and though this cause may not have operated on every occasion, yet it is always useful to*] bear it in mind. Its reality in some particular cases is too obvious, at least in this quarter, to escape the notice of the most indifferent, or even prejudiced observer. I have therefore adopted these terms, considering them conducive to precision, and as having the sanction of such high authority. The angular fragments and rubbish, which are generally found either in their original position or only so far removed as may be traced to the action of gravity, are termed by Dr. MacCulloch, "alluvium in situ," and "alluvium of descent." I have ventured to use the term debris.

9. In the mineralogical details, I have adopted the nomenclature lately proposed in the system of Professor Mohs of Freyberg. The synonyms in this science have, it must be confessed, become too numerous, and the knowledge of them forms a very considerable part of the little that is to be learned from what are called systems of Mineralogy. To

adopt, then, a new set of terms may seem like increasing the difficulty of making ourselves intelligible, and wilfully adding to the confusion. But amongst the old names, there are none generally received, all being originally imposed in an arbitrary [*manner.*] But in the new terminology there are legitimate grounds for selection, the names being connected with a system of arrangement, which, if it be not all that could be wished, is yet extremely convenient. They express in a greater or less degree, the relations which these minerals have to each other ; in other words, their places in the system.

There appears also little doubt but that, eventually, this system will be universally adopted, and those names supersede the present barbarous collection, not more puzzling by their numbers, than objectionable for the total want of euphony, and [*I have*] given some account of the mineral productions considered in an economical point of view, and with reference to the question of the due development of the resources of these provinces. Their value is not to be correctly estimated in the present condition of the country. When an improved system of government shall have had time to produce its full fruits in the increase of the population, and the improvement of its habits, in exciting a taste for the arts and conveniences of civilized life, and in effecting ready modes of communication, and effectual means of transport, it will be seen how many and [*how vast are the resources which here present*] themselves, which [*under good*] management, might be made sufficiently productive to become worthy of attention to a Government disposed to improve its resources and to leave no source of revenue neglected.

11. Gold and silver have in every age been sought after with avidity as the most prolific sources of national wealth. Nothing, however, can be more certain, than that, in reality, they are the least productive of all the several different mineral resources. The comparatively small quantity in which these metals are found, and the greater expence in raising them, satisfactorily account for this apparent paradox. In South [*America this is well known to the*] speculators in mines. It is there a common saying, that a copper mine is a fortune, a silver one scarcely pays itself, but a gold mine is ruin."

12. It is not then as considering the existence of the precious metals as the most promising, or the most productive, that I would lay stress on the great probability which there is of the discovery of a mine of gold

within these provinces. The reasons on which this probability rests, will be found in the Supplementary Paper.\* Whether the discovery may in any reasonable period reward the zeal of an enquirer, or may wait finally that advanced stage of improvement in [*which all the resources of a country are carefully and accurately explored is a problem, the*] solution of which it were vain to seek. But of the actual existence of the metal within these mountains, no one can doubt who will read the few details I have given.

13. In the copper, lead, and iron, however, in which the province abounds, may be found a more tangible, as well as more productive source of wealth. It is certain that the former metal exists in very considerable quantity, and for the iron, nothing is wanting but a proper system of management to render it superior to that of England. To her repositories of these metals, of tin, and of the mineral coal, is England mainly indebted, [*for her vast wealth and power ; and it is strange that they should be neglected in India, as if*] the truly valuable minerals were the gold of Potosi, or the diamonds of Brazil and Golconda. Why they should not here equally prove mines of wealth, if properly managed, appears difficult to understand. With the ore in abundance, fuel, and other means of reduction at hand, labour cheap, a very short line of mountain carriage, and half of that a line of made road, what is there, but capital and skill required to produce any quantity of the metal, and considerably under the present market price ?

14. But these though probably the most productive, are not the only mineral sources of wealth                   \*                   \*                   \*                   \*  
nearly its weight of silver, as even though it should not all prove to be of such first rate quality, yet the inferior kinds are also of such extensive use and application, as to render it a truly valuable deposit. Quarries also of marble, of slate, of potstone, of gypsum, supplies of sulphur, of sulphate of iron, and of alum are found. The trade in borax is well worthy of attention, and no doubt the whole supply of Europe might be drawn through these mountains. If to these be added other articles of trade and consumption, such as timber, hemp, bees' wax, wool, and live stock, as sheep, &c. it will readily be acknowledged in

\* Captain Herbert alludes here to his paper on " the Mineral Productions of the Himmalaya Mountains, " p. 236 Part I. Vol. XVIII. *Trans. As. Socy.*—ED.

contemplating these [*provinces, that they are by no means so barren or so worthless as may at first sight appear.*] The indigenous population is not likely speedily to improve, or to enter into *these* views, at least without the support of European capital and the example of European enterprise. And certainly, if the experiment of European colonization is ever to be tried in India, we cannot select a better spot than these mountains, whether we consider the favorable nature of the climate, the great room for European improvements, the quantity of available land, or lastly, the nursery which such a colony might form of a hardy and warlike race to which we might in the hour of need owe the safety of the empire. [*But these views may be by many thought*] visionary, and [*I now*] turn to notice, before concluding these preliminary remarks, one other probable source of wealth, which though not, strictly speaking, belonging to these districts, is yet at no great distance from them; and to the discovery of which, should it be discovered, the geological investigations now going on must furnish the key. I allude to the strong reasons I have brought forward for believing in the existence of coal in some part of the Dooab; such a discovery would indeed be more valuable than that of a mine of the precious metals. In the great scarcity of fire wood, [*this mineral*] would be invaluable. When we consider too how completely the Dooab is adapted by nature to the ready formation of a complete system of internal communication, we shall be convinced that it would be sufficient to give an astonishing impetus to the march of improvement, and effect probably in a few years such a change as is difficult to form even an idea of at the present moment.

The following paper may be conveniently divided into five sections, the subject of each being as follows :—

1. Physical aspect and arrangement of the surface.
2. Geological details.
3. Recapitulation of the preceding, or general view of the geological structure.
4. Conclusion; with notices of the most remarkable features of the preceding general view as compared with systems, and with observation in other countries.
5. Mineral productions, comprising an account of the mines, method of working, and suggestions for their improvement.\*

\* See Note at p. vi.

Of these the second being the most voluminous, and consisting entirely of practical details, can only be interesting to a professed geologist. [*It is my intention hereafter to label and refer each rock specimen of the large collection*] I have made to the account of its occurrence as here given, by number, so that, when the paper is studied with the cabinet to refer to, I consider that it will give as correct an idea of the geology of the province as could be had by actually travelling over it. And there will be the further benefit that the experienced geologist will be able to correct any mistakes into which I may have fallen, either through inadvertence or want of knowledge.

The first section constitutes a detailed and systematic account of the Physical Geography of this district, being the first ever given. Such a view independent of [*its connection with the geological details, to the full comprehension of which it is absolutely necessary, is also much*] called for as a contribution to general Geography, the latest works published being singularly deficient in details on this subject, as well as erroneous in the few that are given. As an example, I would refer to Mr. Meyer's Geography, a very costly and bulky work, lately published, and to Brewster's and Rees' Cyclopædias, (Art. Himalaya and Physical Geography.) In none of these works is a clear idea obtainable of the physical features of this interesting quarter of the globe. I could have wished to have had a little more [*time for the systematic arrangement of the facts and opinions in this*] division, and I intend to improve and extend it considerably hereafter.

The geological reflections with which the paper concludes are, I am sensible, those in which I stand most in need of candid criticism. The early period at which I have been obliged to draw them up, the want of books of reference, till within the last two months that I have been in Calcutta, and the necessity of attending to the arrangement, digestion, and revision of the other parts of the report during this time, thus distracting my attention; added to the anxiety I have felt to [*do justice to*] the subject will, I trust, plead some excuse for the deficiencies observable in it. Altogether, indeed, I would state as a sufficient apology for the errors which may be found doubtless in every part of the paper, the great hurry entailed upon me in the preparation of the fair copy owing to the difficulties and perplexities originating in circumstances which I have explained in my letter accompanying.

But these hindrances are now I trust at an end, and with the assistance so liberally granted me, I am not without hopes of improving and adding to this paper so [*as to render it not altogether discreditable to myself, and I trust such as may*] embolden me to look forward to the patronage of Government in the eventually contemplated act of publication.

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## SKETCH OF THE GEOLOGY OF THE HIMMALAYAS.

### SECTION I.

1. Previously to entering on the detailed description which is to be the subject of this paper, it will be necessary to take a general but cursory view of the Geography of Central Asia. This great country, so interesting in every point of view, constitutes it is probable, whether we consider its physical aspect, or its geological structure, a system, or whole, without [*some general view of which to assist us, none of its*] parts can be fully [*comprehended.*] It is in their connection with this singular country that we shall see some of the most interesting relations of the tract in question. Nor does it appear possible to obtain a clear and connected idea of those relations, without extending our view to the great whole, of which our mountain provinces form but a part.

2. Unfortunately, however, so deep is the obscurity which covers the Physical Geography of Central Asia, that little is to be done beyond offering probable guesses on many of the most important points. The [*accounts of geographers and travellers, even those lately given to the*] public, are so meagre as to leave us little to glean. And even in that little they are frequently so contradictory, that it is not easy to obtain any thing like certainty, except as to a few leading features.<sup>1</sup> Even

1. It is quite astonishing how little we know even of countries comparatively easy of access, and often visited, I mean of their physical features. Of Persia we do not to this day know the elevations of its great plains and mountain ranges. Of Cabul we are equally ignorant. It would appear as if observations, amongst the easiest to be made, and requiring little skill or ability, have yet a mysterious terror for the otherwise most intelligent and able travellers. Our ignorance is the more provoking, as very near approximations to truth may be made in all the several results required by Physical Geography, with very slender means, and scarcely any science: how much may be done by a traveller possessed of only a pocket sextant, a good watch, a thermometer, and a pocket compass.



these will throw perhaps some light on the subject, and will at all events enable us to take a view of this tract, altogether different from what has hitherto been adopted.

3. If we [*consider the map of Asia, we shall be struck with the appearance of a*] large central space, which is strongly marked by the circumstance of being but little intersected by rivers, while yet on every side innumerable streams flow from it, and unite to form some of the largest rivers of the Old World. The Amur, the Hoangho, the Yangtse-Kiang, the Maykaung, the Maygive, the Irrawaddy, the Kiendun, the Burampooter, the Ganges, the Indus, the Oxus, the Jaxartes, the Obi, the Jenisei, and the Lena surround with their sources this tract, and with courses varying from 1,200 to 3,000 miles in length, radiate from it to the surrounding seas in every direction.

4. Inasmuch as the source of every river must be higher than any other part of its course, it is just to infer, that the zone in which these rivers originate is higher than the plains through which [*they flow*] to seek the Ocean. [*Their*] lengths of course may be considered to be, within certain limits, proportional to the elevation of the source; we may further infer, that the line which connects the water-heads of these great rivers, must be of very considerable elevation, compared with other parts of Asia external to that line.

5. We know from observation, that the tract in which are found the sources of the Ganges, the Indus, the Oxus, the Obi, the Jenisei, and the Lena, is diversified by lofty mountains, some of them the highest on the globe. The Himalaya, the Karakoorum, the Hindoo Koh, the Beloor Tag, the Bogdo, the Alak, and the Altai mountains are all found along this line. We are then entitled to infer, that this mountain zone is in like manner continued to the S. E. and to the E., consequently that it completely surrounds the central tract.

6. Of the particular features of the interior, little is known. It has been usual to call it a plateau, and to suppose it of very great elevation. The great sandy desert of Cobi, which is known to occupy part of it, affords some grounds for this appellation; but with regard to the conviction of its great elevation, this seems to have originated in incorrect ideas of natural boundaries, and a consequent misapprehension of what is, or is not the central plateau. [*It has been*] presumed that the [*whole line of*] elevation along the mountain barrier above indicated should be

considered as the bounding limit, and that every point within this line was entitled to the above appellation.

7. Captain Webb, amongst others, appears to have fallen into this mistake in assigning the bed of the Sutlej (14,000 feet) as the lowest level of the plateau,<sup>2</sup> whereas the bed of the Sutlej belongs to the Sinditic Basin, (so in MSS. qu: *Inditic*?) and is consequently part of the barrier zone which surrounds the central tract. In like manner, the country visited by Captain Turner, and commonly known as Thibet, the description of which is generally adopted as that applicable to the interior, must be considered also as part of the mountain barrier, since it is watered by the streams or feeders of the Sanpo; which if it be not the Burampooter, must be either the Kiendun, or the Irrawaddy.

8. Considered [*as a question*] of Physical Geography, [*the true*] line of boundary is undoubtedly the chain of water-heads, and this is by no means synonymous with the line of greatest elevation.<sup>4</sup> It may be that the central tract is not of such great elevation as has too hastily been presumed. It may be that this presumption is correct; the mountain barrier which surrounds it serving, as in the [*case*] of the Ghats of Malwa,<sup>5</sup> to [*support*] a high table land of tolerably even surface. But however this be, it is not the less necessary to avoid confounding the boundary tract of mountain land with the central included area.

9. Of other particulars we are equally ignorant; what its rivers are, if any; and whither they flow; some we do know [*contribute to*] certain

2 The *Quarterly Review* in reporting this fact, has not noticed the error. But this work has never been celebrated for its disquisitions on physical or mathematical subjects. In this particular article, and the abusive one on the same subject which called for it, they are particularly open to censure. The two productions form an amusing contrast.

3 The latter is D'Anville's opinion, the former Rennel's. The great mistake into which this acute geographer fell regarding the course of the Sutlej and Ganges, naturally makes one distrustful of his authority on this point. The little light which the employment of our troops to the Eastward has thrown on the subject, tends to add strength to these doubts.

4 This remark is not unnecessary, for it is a mistake made by many, who conceive that because the source of a river must of necessity be higher than any part of its bed, *therefore* all the elevations in its immediate neighbourhood must be higher than those situated near a more advanced part of its course.

5. There is not however the analogy of geological structure to make this conclusion probable. Malwa is of the trap or overlying formation one which has derived its name from this peculiarity of structure, whereas all the evidence we have on the subject tends to support the opinion of this great circular barrier being composed by primary rocks.

lakes; and some [*we presume*] are lost in the sands of the Great Desert. But to obtain any thing like detail, on these and many other points, is in the present obscurity of the subject impossible. Of its geological structure, we have not an idea that is not purely hypothetical.<sup>6</sup> And yet, it may be averred, that the geology of Asia can never be rendered fully intelligible, or even the science itself be placed on a firm basis, till the whole of this tract be fully explored, and the rich mine of illustrations, which it doubtless contains, be fully laid open.

10. Considered in its various relations to Asia, I might even say to the Old World, it is undoubtedly the most interesting spot on the surface of the globe, and it is certain that the traveller who shall first succeed in developing these relations in all their bearings, will establish for himself no inconsiderable name. Unfortunately for science, this task is not likely to be soon effected. The jealousy of the Chinese government, to which the greater part of it belongs, opposing insurmountable obstacles to the progress of investigation and discovery.<sup>7</sup>

## SECTION II.

11. It appears [*certain that*] this central area—whether we call it a plateau, a basin, or series of basins—is surrounded on all sides by a broad zone of mountain land in which originate the great rivers of Asia. The [*tract*] of which I am now to give a description, and which comprises all the British possessions within the mountains, forms but an inconsiderable portion either in length or breadth of this great Alpine belt. In interest of description, however, it does not yield to any part of it. For within its boundaries rise some of the most remarkable peaks of the Himalaya summits, not more celebrated in the annals of superstition than in those of science, and from its area spring the sources which unite to form the Ganges. The sacred River! the fertiliser of pro-

6 That is of the interior.

7 The extraordinary perseverance and intrepidity which distinguished the late Mr. Moorcroft, bade fair to give us some knowledge of part of this country, certainly of a great portion of the surrounding mountain tract, had his life been spared. Few men have possessed in an equal degree the qualifications necessary to ensure a traveller's progress through those countries, and it is not likely that an enquiring spirit like his would have rested while any thing remained to be learned, or any quarter open to research presented itself. His premature death, while on the point of returning to his countrymen, is much to be deplored. It is hoped that the materials collected may yet be made available to the increase of our knowledge of those countries.

vinces! the waters of which bear health and plenty through a course of 1,200 miles!

12. The boundaries of this tract are to the S. E. and N. W.; the rivers Kalee and Sutlej; to the N. E. a line drawn from the Kalapancee fountain, (one of the sources of the Kalee,) to the confluence of the Tedong river with the Sutlej; and on the S. W. by a line drawn from the Kalee, in latitude  $29^{\circ}$ , longitude  $80^{\circ} 8'$ , to Ropur, on the Sutlej. These boundaries form a right-angled trapezium, the two parallel and longest sides being directed about N.  $60^{\circ}$  W., the rectangular side being to the Eastward, and the oblique side to the N. W., forming angles of  $50^{\circ}$  and  $130^{\circ}$  with the parallels. The only exceptions to the regularity of these boundaries are: 1. A narrow strip comprehending part of the vallies of the Sutlej and Speetee rivers, which runs up as high as latitude  $32^{\circ}$ , and which is within the British limits. 2. The valley of the Jahnuvi river, or right bank of the Bhageettee, which though included by the above boundary, is considered to be part of Thibet.<sup>8</sup>

13. The length of the several bounding lines are as follows:—

1. That facing the S. W. .... 272 miles.
2. .... N. E. .... 192 ditto.
3. .... S. E. .... 96 ditto.
4. .... N. W. .... 120 ditto.

and the superficial extent in round numbers may be taken at 23,000 square miles. If we include the slip of plain country along the S. W. boundary, and which is geologically connected with it, the extent will be about equal to that of England Proper.

14. The tract limited by the boundaries just particularised, may be described as altogether mountainous. A few inconsiderable and level spots, hardly to be called vallies, are found, but neither is their number or extent such as to render any qualification of this description necessary.

<sup>8</sup> The only village, called Ohoongsa or Neelung, owes also a nominal subjection to the Rajahs of Gurhwal and Bissahir, whose countries are conterminous with this district. The villagers are of the Thibetan race. Their village consists of about sixty houses, which are but little raised above the ground and flat roofed, on account of the extreme violence of the winds which prevail in that quarter. It is situated on the right bank of the Jahnuvi, in latitude  $31^{\circ} 8'$ , longitude  $79^{\circ} 5'$ , and has an elevation of about 10,000 feet. The river is about 100 feet broad, and from four to six feet deep.

In ruggedness of feature, it does not yield probably to any country in the world, and such is the irregular and confused appearance, which the endless ramification of its mountain ranges presents, that it is with difficulty the unpractised observer can persuade himself that any thing like order or regularity can be deduced out of such a seeming chaos.<sup>9</sup>

15. No continuous chain of elevations can be distinguished on a first and cursory view ; no great vallies, no table lands, nothing in fact to lend a clue to the development of the mountain masses. The aspect, from whatever height the country be viewed, is that of an assemblage of elevated peaks, irregularly and confusedly heaped together. Even the snowy chain, though defined to a certain degree by a phenomenon so singular on a first view to the inhabitant of the plain country, loses on a nearer approach all character of continuity and regularity, and appears under the same confused and irregular aspect which the lower elevations are observed to bear.

16. It is only by tracing the courses of the rivers and their tributary streams, that a clue can be found to lead the observer out of this labyrinth. By connecting their sources, and by following out the devious windings of the several feeders, an idea is obtained of the extent, the direction, and the connection of the several ranges. Such an analysis, (vide sketch of the great river basins,) will be found to modify considerably the notions which the first view of this mountain tract from the plains is calculated to give.

17. Instead of a succession of parallel and continuous ranges running S. E. to N. W., and rising one behind another in regular array and increasing elevation, till the series is closed in the farthest distance by the line of snow-clad peaks,<sup>10</sup> we see only one continuous range of any extent forming an irregularly curved line, which bends round the tract commencing on the N. E. angle, with a North-westerly direction,

<sup>9</sup> This is also the arrangement, or rather apparent want of arrangement observed by Saussure in the Alps, who says, "When we contemplate the range of which Mount Blanc forms a part, from less considerable elevations, it appears as if these colossal mountains were situated in a line, and formed a chain, but this appearance vanishes entirely from the bird's-eye view here presented. They are distributed in great masses or groups of various strange forms," &c. &c.

<sup>10</sup> The deception is so strong in viewing these mountains from the plains, that most people continue, even after having visited the interior, to speak of the 1st, 2d, 3d, and snowy ranges.

which it gradually alters to a South-easterly one on the S. W. angle, and latterly due South, just before it is lost in the plain country.

18. This range forms one of the boundaries of the basin of the Sutlej which bends round the convex side, while within its concavity, are contained the numerous sources of the Ganges, the several feeders of which are separated by a most intricate ramification. On this account, (as it will be necessary often to refer to it,) and as there is no native name for it, it may be termed the Indo-Gangetic chain.

19. We see then, that with the exception of a narrow strip belonging to the Sutlej, all this tract is occupied by the sources of the three principal branches of the Ganges; viz. the Jumna, the Ganges Proper, and the Kalee.<sup>11</sup> A line drawn through the points where they severally enter the plains, represents pretty exactly the common boundary of plain and mountain land. It is the S. W. boundary mentioned in Art. 12, and its length from Ropur, the *debouché* of the Sutlej, to Brihon Deo, that of the Kalee is 272 miles.

20. The great disproportion of drainage effected by the Sutlej, which is one of the boundaries, and by the other or Gangetic system, is very striking. Not less so is the difference of their courses as to direction, the one running nearly due West, the other South; and as to length, the former having a course from its origin in Lake Monsuror to its *debouché* at Ropur of 550 miles, whereas the longest branch of the latter has only a course of 292 miles. It is this want of analogy in the character of these two great river systems that forbid our speculating on the arrangement of surface which may obtain beyond them.

21. In the case of two rivers of such magnitude as the Indus and Ganges, which direct their waters to the opposite seas of India, we naturally expect to trace some indications, however obscure, of a separating elevated tract, something farther than the point where the Indo-Gangetic chain ceases. No such indications are however found, for the intermediate tract is much at the same level as the interior of the river districts which it separates.<sup>12</sup> Physical Geography is full of these disappointments,

11 In terming the Kalee one of the sources of the Ganges, I mean of course the Ganges of Bengal; the Kalee is the principal branch of the Dewah or Gogra river, which falls into the former near Chuprah.

12 This fact is very important, and points out the facility of establishing a system of irrigation all over the Dooab and Rohilkund. I ascertained that the bed of the Jumna at Raj Ghat, on the road between Chilkana and Boorea, is but five feet

a proof, if it were wanting, that we are still but imperfectly acquainted with the structure of the globe.

22. The length of the Indo-Gangetic chain is about 340 miles, as defined on one side by the Kalapanee fountain, one of the sources of the Kalee, where our first precise knowledge of it commences, and on the other by its termination in the plain country, which is sufficiently sudden to be definite. From its gradually decreasing elevation along this line, it is natural to infer, that it is but a ramification of that more extensive line of water-heads, (Art. 5,) which would exclude from the central plateau all the mountain tract watered by the Sanpo and the Indus, as well as by the Ganges. We are not then to suppose that in crossing the Indo-Gangetic chain, we have made a near, or even the nearest appulse to the great table land of Tartary;<sup>13</sup> we are equally near it in the basin of the Ganges. But if this central plateau really means any thing, it must be something distinct from its surrounding barrier of mountain land, or if not, all the river basins are equally entitled to the appellation.

23. Next in extent to the Indo-Gangetic chain are the two principal ramifications; viz. that which separates the subordinate basin of the Jumna from that of the Ganges Proper, and that of the latter river from that of the Kalee. From their origin in the parent ridge to where they are lost in the plain country, their length is about 160 miles. Like the principal chain, they cease suddenly, nor is there any trace either in the Doab or in Rohilkund of a continuation of them, however obscure.<sup>14</sup>

below the level of the Saharunpore cantonment, (month of March.) At Badshahee Mahul, it is 200 feet. Here then is a water-head capable of supplying any number of canals, and for a continuance the Ganges offers similar facilities for Rohilkund. The elevation of its bed at Hurdwar is 1,000 feet above the sea, while that of Mooradabad is only 609 feet.

<sup>13</sup> The bed of the Sutlej can by no figure be termed a table land, for it is a deep valley shut in by lofty mountains. But even if it were, it is not the table land of Tartary, which is the country watered by the Oxus and Jaxartes. It is a strange mistake which is made, and by many who have the reputation of being well informed, that of confounding the Calmuck or Mongolian race with the Tartars, and their country with Tartary, whereas no two races can be more distinctly marked than these are. It was the country of Thibet, and not Tartary, which Captain Webb saw, and which is inhabited by a tribe of Calmucks or Eleuths.

<sup>14</sup> A levelling operation which I executed some years ago, connecting Seharunpore with the Jumna, and which furnished the result mentioned in the note, page xvii. established also a more unexpected conclusion; viz. that the ground in the immediate vicinity of the river for a short distance rises to the height of forty-five feet above its level in the cold season.

The great disproportion in the length of these branches compared with those thrown off to the Sutlej, is very striking, (Art. 20.)

24. From these, as well as from the main chain, proceed a multitude of other ridges, and from these again a third set, and so on till the area becomes covered with this intricate ramification, which but for the assistance derived from observing the courses of the rivers, would almost bid defiance to any analysis. The longest of these, is that which separates the principal branches of the Ganges Proper; the Bhageerettee and the Alecknunda, of the Jumna; the Jumna Proper, and Fouse, and of the Kalee; the Gunjeea, and the Ramgunga. These vary from fifty to 100 miles in length. It would be useless to enumerate the others, especially as they have no distinctive appellations. Nor would the enumeration add any clearness to our idea of the aspect of the country. Suffice it to say, that as they descend in the scale of subordination, they become shorter, and diminish in elevation.<sup>15</sup>

25. All the passes leading into the country of Oondes, are situated in the main chain, it being indeed the only one, as will be evident from the foregoing description, necessary to be traversed between the Dooab and valley of the Sutlej, unless for the convenience of a better road, or more regular supplies. These passes have all, with the exception of three, been visited, and their height above the sea determined, excepting the main pass, of which though supposed to be the highest, it is to be regretted Mr. Tate, the Surveyor, who visited it has left us no measurement. The higher points of the chain are not so well ascertained in all their details, owing partly to their not being visible, and partly to an idea which has prevailed of their great inferiority to the southern peaks, or those included within the Gangetic basin, and consequently ramifications from this chain.

26. It appears however to be sufficiently established, that from latitude  $31^{\circ} 23'$ , longitude  $77^{\circ} 50'$ , the elevation of this chain is considerable, being with the exception of a few passes, clothed in the livery of snow all the year round. Its tendency to fall off in that direction is evinced by the gradually decreasing height of the passes, and from the latter point to its termination, little snow is seen, excepting during the winter months. In latitude  $30^{\circ} 35'$ , longitude  $17'$ , the  $77^{\circ}$  elevations of what

<sup>15</sup> This is to be understood, however, only in a general sense, as in many instances the subordinate ridge rises to a greater elevation than that from which it ramifies.



may be called one of its passes is only 2,500 feet. A little beyond this it is lost in the plain country.

27. The following Table of heights contains every point measured in this chain, and the accompanying section embodies the particulars. I have included the names of a few passes, which though not measured, appeared worthy of notice, either as forming frequented points of communication with Oondes, or as presenting unusual difficulties to the few venturous mountaineers who have attempted them :—

Table of the Elevations of the Principal Peaks and Passes of the Indo-Gangetic Chain.

Peak or Pass.	Elevation.	Remarks.
	Feet above Sea.	
Pass to Tuklakot, ... ..	17,598	{ This Pass is on the N. E. corner of the Mountain Tract, and leads to Tuklakot, a Chinese or Thibetan factory.
Koontas Peak, No. 2, ... ..	20,992	
Koontas Peak, No. 1, ... ..	22,441	
Labong Pass, ... ..	18,870	
Danna Pass (at least,) ... ..	18,000	{ Not measured { These are two of the most frequented, the first is easy, the other difficult.
Jowahir Pass (at least,) ... ..	17,000	
Neetee Pass, ... ..	16,814	
Mane Pass (said to be,) ... ..	18,000	Visited, but not measured.
Neelung Pass (probably,) ... ..	16,000	Is said to be very easy of access.
The Cone (Snowy Peak,) ... ..	21,178	{ These Peaks are visible from the Plains, they give rise on the Southern side to the Tonse.
No. 39, vide As. Res., 14 vol.	19,481	
L. Ditto, ... ..	19,512	
The Needle, ... ..	19,064	
Goonass Pass, ... ..	15,459	A good deal of snow in Sept.
Borando Pass, ... ..	15,000	Much snow in June.
j (Snowy Peak, vide as above,) ... ..	17,425	
i Ditto, ... ..	17,331	
h Ditto, ... ..	17,337	
g Ditto, ... ..	17,035	
Shatool Pass (at least,) ... ..	15,600	A very difficult Pass.
d ... ..	17,174	
C ... ..	16,982	
a ... ..	17,044	
Pass below Bagee Fort, ... ..	9,039	{ The range has here a S. W. direction.
Pass below Bagee Fort, ... ..	9,039	
Whartoo Peak, ... ..	10,673	
Nagkunda Pass, ... ..	9,000	
Theog Fort, ... ..	7,926	

Peak or Pass.		Elevation.	Remarks.
		Feet above Sea.	
Mahasoo Temple,	.....	9,265	{ The Camp was 8,965 feet, temple 300 more.
Juke Peak,	... ..	8,120	
Tarba,	... ..	5,000	
Kimdera Pass,	... ..	4,989	
Kol Peak,	... ..	7,612	
Ujmergurh,	... ..	4,000	
Bhoora Peak,	... ..	6,439	
Suran Village,	... ..	5,500	
Bonytee Debee,	... ..	5,120	
Jytuk Fort,	... ..	4,854	
Gutasun Debee,	... ..	2,500	Not measured.
Sandstone Hills,	... ..	3,000	Ditto.
Foot of Hills,	... ..	1,500	Ditto.

28. A geologist of some eminence, and remarkable for the soundness of his views says, that "writers have erroneously confounded the line of greatest elevation with a chain of water-heads." If we take a survey of the present tract, we shall every where see this opinion confirmed. The range above described, is that which separates the two river systems of the Ganges and the Indus, the principal drains on the side of India from the central plateau. But it is by no means the highest ground, for it is within these basins, and not on their common boundary, that are found disposed those elevated peaks, the real height of which has so long formed a subject of discussion,<sup>16</sup> and from which, as considered the highest summits of the globe, this tract derives one of its principal sources of interest.

29. The term Himmala, generally applied to these peaks, means snowy, so that it is rather descriptive of a broad zone or belt, than of a series of peaks as distinguished from the lower ridges in their immediate vicinity. They have been called a chain, yet no term is less descriptive of the manner in which they are arranged; neither are they a

<sup>16</sup> It is a curious fact in the history of science the extreme slowness and even unwillingness with which this result has been admitted. Theoretical considerations founded on an experiment in an air pump were held to be sufficient grounds for doubting of our Indian observers. "Jurare in verbo magistri" was the order of the day, and the authority of a name was considered sufficient to justify doubts of results which should have been judged of on their own merits alone. The infallibility of their own dogmas was never even questioned.

series of groups,<sup>17</sup> but rather of transverse ridges (at least within the basin of the Ganges,) which ramify from the Indo-Gangetic chain, over which they yet tower several thousand feet.

30. A line or plane connecting their summits will represent that of greatest elevation. It is evident from Art. 17, that it must cross the Indo-Gangetic chain. It is nearly certain, that in like manner the highest summits of the next portion of the great circular barrier are to be found within the basin of the Indus, and the line continued still farther would doubtless cross the separating chain of the Oxus.<sup>18</sup> Whether this arrangement holds all round, or how far; what is the elevation of this line in every part of its course; of these points, and of many others equally interesting, we are entirely ignorant.<sup>19</sup>

31. But we do know, that from the Hindoo Koh, or Snowy Mountains of Cabul, to the peaks visible from Patna, this line or plane never sinks for any distance below 21,000 feet. Lieutenant Macartney measured one of the former, and found the height 20,493 feet;<sup>20</sup> and in 1815, when with my corps on the Goruckpore and Betwah frontiers, I determined

17 On design communement toutes les elevations de terrain, pour peu qu'ils se prolongent, sous le nom general de chaines. Mais il est certain que les montagnes forment plus souvent des groupes que des chaines. Mais les chaines les plus apparentes ne sont souvent que de Lignes de groupes "Malte Brunn *Precis de la Geographie*," tom. 2, p. 160.

18 It has been thought otherwise: the Himalaya have been supposed to find their continuation through Persia, and the chains of Taurus and Caucasus as far as the Caspian Sea. The point may, however, easily be settled, for it appears from Captain Christie's Journal, that there is no snow on the mountains in the neighbourhood of Herat, and it is known from the Ayeen Akberry, that the journey from Bokhara is unattended with difficulty. It is therefore evident, that the Himalaya, as such, have no continuation in this quarter. But it may be said, and with truth, that the phenomenon of snow is no test of the identity of a chain or ridge of mountains. The Himalaya, however, is no chain, as I have already shewn, and when we speak of these peaks as constituting a series, it is either as snow-clad summits, or as the highest in their immediate neighbourhood. Considered in either of these lights, their continuation must be sought in the Beloor Tag, and that these are situated within the basin of the Oxus, admits of little doubt. Lieutenant Macartney appears to have been puzzled with regard to this point, but this was owing to the mistake he fell into regarding the course of the Indus. He at once decides against the common opinion. Vide also Rees' *Cyclopædia*. Art. *Altai Belur*.

19 The papers of Mr. Moorcroft and Mr. Trebeck, should they ever be recovered, will doubtless supply many interesting particulars on this subject, and it would be extremely curious to compare their results with what is here hypothetically stated.

20 So in the account of Cabul, but from the data given, allowing one-tenth for refraction, I find 19,470; doubtless the place of observation is elevated 1,000 feet or more above the sea.

one of the latter to have an elevation of 27,000 feet.<sup>21</sup> Those who have travelled through Oude, within a sufficient distance of the mountain tract, know that the series continues in all that line without any such inferiority, at least as the eye can detect. This is a presumption, if it be no more.<sup>22</sup>

32. The fact, that in a line of 500 miles two summits are found exceeding five miles in perpendicular height, not isolated, but connected to appearance by a regular series of peaks of very little inferior elevation, is alone calculated to give us a lively idea of the enormous magnitude of this mountain zone. It is almost certain, that if we confine ourselves to 21,000 feet, we may find a connected line of such peaks extending through a distance of 1,000 miles. When I say connected, I mean without any apparent breaks, because as already noticed of those within the basin of the Ganges, it is probable that they are not connected in reality, except through the line of water-heads from which they ramify.

33. But, it may be asked, how shall we be certain that this is really the line of greatest elevation, and that is on this side the highest peaks are within the river districts, and not on their boundary; may they not be so likewise on the other side, and consequently there be found in the basin of the Indus, as suggested by M. Humboldt, still loftier summits than those which distinguish that of the Ganges?

34. To this it may be answered, first, that as we have already seen this line of greatest elevation is undoubtedly prolonged into the basin of

21 This is the peak mentioned by Mr. Colebrooke, (As. Res.) under the name of Dhawala-giri, or the White Mountain. Captain Webb, whose measurement he reports, found nearly the same result. Captain Blake also, when employed as Surveyor on the Goruckpore frontier, found the same height nearly. I consider my measurement as less exceptionable than either of these, for the following reasons:—

(1.) The position of the peak depends on a triangulation established from a base of 1,142 feet measured with a chain, and not from the protraction of the route, the angles being taken by an excellent sextant of Berge's. (2.) The angle of elevation was taken repeatedly, and at different seasons, by reflection from mercury with the same sextant. (3.) A much nearer approach to the peak was made one of the stations, being distant only seventy miles, whereas the nearest of theirs was 120 miles.

22. It would be very desirable to have the positions and elevations of the principal summits along our frontier fixed with tolerable correctness. Such a task would not be either difficult or tedious, provided the attention were confined to those points alone. It would form the very best foundation for a correct map of India, for these peaks once fixed, every place from whence they are visible, may be settled with equal precision, and thus afford means of correcting the Easting or Westing of our protractions, which is the great desideratum. This subject has been noticed by Major Hodgson in the paper in 14th vol. A. S. Res.

the Indus, and most probably into that of the Oxus also, that in some part of this line there may be peaks higher than those in the Gangetic basin is possible, nor can we assign any reason, why it should be improbable. But that there is a higher chain, or series of peaks, beyond the Sutlej, parallel to that which we are considering, is an opinion which is supported by no probabilities whatever.

35. Undoubtedly the subject is even yet involved in some obscurity, which cannot be fully cleared up till all the particulars in that quarter become known. The only direct evidence which we possess on the subject is unfavorable to this conclusion. Mr. Moorcroft, who crossed, and Captain Webb, who visited the Neetee Pass, are both silent as to the existence of such loftier peaks to the N. or N. E. In my journey to lay down the course of the Sutlej I found that after passing this line, all the loftier peaks appeared to the Southward, while those to the North were of a totally different character, rounded summits, almost free from snow, and evidently of less height. In like manner in ascending the height above Shipkee, (16,000 feet), the peaks to the N. E., East, and S. E., were of this character, while to the S. and S. W. appeared those of the true Himalaya aspect.<sup>24</sup> Nor does Captain Webb, in his visit to the head of the Kalapanee river, notice any high peaks as being visible to the N. or N. E., though he was then not twenty miles from the lake Mansuror.

36. We are justified then, by all that we know of this elevated tract, in considering it as unconnected altogether with the disposition of the water-heads. Nor can any principle of arrangement be traced, which will allow of our proceeding one step beyond that point, at which our positive knowledge of the subject terminates. We may, if we choose, guess, that beyond this, another line still higher may be found, and we may even add a third, still more lofty, but we must be contented to have these conclusions considered as mere guesses too, unsupported by analogy, and having no claim whatever to be received even as probable.

<sup>23</sup> Further reasons will appear for doubting the existence of a series of loftier summits to the North, when we come to the geological details. Strange that Europe should have been so slow to acknowledge the actual height of the Himalaya; still stranger, that being unable any longer to deny the accuracy of the measurement, a higher range must be supposed to the North of it, so that it may still be averred, they are not the highest.

<sup>24</sup> Vide *Asiatic Society's Researches*, Vol. 15.

37. It should be noticed, however, that the term line is incorrectly used, or at least with great latitude, and even substituting that of plane, it is still necessary to bear in mind, that its direction, whether as referred to a great circle, or the loxodromic curve, is by no means uniform, or even regular in its deviations ; unless indeed we regard it as of considerable breadth, and in that case its surface would be very irregularly studded with peaks. In this way we may certainly affirm, that it is parallel to the common boundary of mountain and plain land. In fact, it is impossible to contemplate such masses disposed along such a distance without feeling convinced, that there is some connection between the greatness of their elevation, and the original formation of the mountain systems in which they are found. The parallelism becomes more obvious when we consider a more extended tract.

38. The following is a Table of all the results hitherto measured, distinguishing also the river basins within which they are situated :—

No.	Designation or Names.	Captain Webb.		Major Hodgson.		River Basin.
		No.	Elevation.	Letter.	Elevation.	
5		27	20,923			...
		26	21,045			...
		25	22,277			...
		24	22,238			...
		23	22,727			...
		22	19,497			...
		21	19,099			...
		20	20,407			...
10		19	22,635			...
		18	21,439			...
		17	19,153			...
		16	17,994			...
		15	22,419			...
		14	25,669			...
15		13	22,313	A No. 2,	25,749	...
		12	23,263	A No. 1,	23,531	...
		11	20,686			...
		9	21,311	A No. 3, B.	23,317 23,441	...
		8	23,164			...
		7	22,578			...
		6	22,498			...
		5	19,106	U. D. Q.	21,612 23,062 19,928	...
		4	21,611			...
		3	22,840			...
		"	...			...

No.	Designation or Names.	Captain Webb.		Major Hodgson.		River Basin.
		No.	Elevation.	Letter.	Elevation.	
35		3	19,938	Q. C.	19,530	...
		"	...	C.	21,940	...
		2	22,058			...
		1	22,345	M.	22,792	...
	St. Patrick,.....	"	...		22,798	...
	St. George,.....	"	...		22,634	...
		"	...	F. C.	21,772	...
	The Pyramid,.....	"	...		21,379	...
		"	...	F.	21,964	...
	Sree Kanta, ..... ..	"	...	G.	20,296	...
	Rudra Humdah, ...	"	...		22,390	...
	Serga Raur, ..... ..	"	...		22,906	...
	Bunder Pooch, ... ..	"	...	E.	20,916	...
	40 Another summit, ...	"	...	E.	20,122	...
	Shippure, ..... ..	"	...		18,681	...
		"	...	C.	21,155	...
		"	...	H.	20,668	...
		"	...		20,501	...
	45	Peak visible from } Jhala, ..... .. }	"	...		18,795
	Ditto Twara, ..... ..	"	...		19,352	...
	The Cone, ..... ..	"	...		21,178	...
	Raldung, ..... ..	"	...		21,411	...
	Rishee Gungtermy,	"	...		21,389	...
50	Poorkyol, ..... ..	"	...		22,700	...

39. In judging of the comparative direction of these summits and those of the Andes, it is not sufficient to be told that the highest of the former overtops Chimborazo, the principal summit of the latter, by nearly one mile of perpendicular altitude ; for this single fact, great as is the difference which it implies, falls short of giving a competent idea of the subject. Let us take the highest summits of the Cordilleras measured by Humboldt, and those of the Andes of Peru by Condamine, and others. Although not the same chain, they are situated on the line of greatest elevation, and in both these particulars, they correspond with the Himmalaya. According to Myers, they are as follows :—

- Chimborazo, ..... 21,441
- Desea Cassada, ..... 19,570
- Cayambe Area, ..... 19,336
- Cotopaxi, ..... 18,891 or 19,155 according to others.
- Antisana, ..... 19,149

Popocatepetl, .....	17,716 or 17,734
Chillatepetl, .....	17,371
Illinissa, .....	17,238

From this list it would appear, that there is but one summit elevated more than 20,000 feet, and only five which exceed 18,000.

40. Of the fifty-one measured peaks of which we have given a table, there are twenty-eight as high, or higher than Chimborazo, and there are forty-four as high, or higher than Desea Cassada, the second summit of America. Popocatepetl, the sixth in order, is overtopped by not less than 100 summits within the limited tract we are considering ; many of the passes even (which are the lowest points) in the Indo-Gangetic range, (which as I have before stated is not the highest ground,) exceed in elevation the sixth summit of America. These facts may perhaps give a more correct idea of the great difference which exists between these two tracts, the loftiest on the globe, and the most remarkable in every point of view. If the rivers of America (and even this is doubtful) exceed in volume and length those of the Old World, at least the mountains must yield.\*

41. The great elevation of these peaks is scarcely more striking than is the depth of the vallies or hollows which separate them, and which are always the beds of the rivers. Thus the Poorkyool Peak towers to a height of 22,700 feet, while its base is washed at a horizontal distance of five miles by the waters of the Sutlej ; the bed of which river has here only an elevation of 9,500 feet. The difference is 13,200 feet in five miles. In like manner the difference of elevation from the summit of the Kuldung Peak to the Sutlej, in a distance of five and half miles, is 14,711 feet. Of the Soommeeroo Peak to the Mundaknee, distant four miles, 11,000 ; of a peak (No. 17, Captain Webb's list) to the Gurjeia, distant two miles, 12,370 ; of the Jowahir Peak to the Goree, distant eleven miles, 15,749. These vallies are far beyond any thing that is to be seen in the Andes.<sup>25</sup>

<sup>25</sup> Although the Andes have no river vallies comparable in depth with these, yet there are some chasms, as they should rather be called, which taking together their

\* Our author was, it will be remembered, writing before Mr. Pentland's measurements of Sorato 25,400, Illimani 24,350, and Descabezado 21,100 feet.—H. P.



42. The above list, if it were thought necessary, might be much increased. It is very true that they are nearly consequences of the manner in which these peaks are disposed, but it is this very disposition which is so singular, and worthy of remark. It is the extraordinary elevation above the ground on which they immediately stand that is so striking to a traveller within these mountains, because it is at once taken in by the eye, and requires no consideration to aid the effect. It is different with summits placed on an elevated table land, where we are continually obliged to remember the height of the latter, and even with this assistance, they fail to astonish and confound the imagination in the degree that a nearer view of the Himalaya is found to do.<sup>26</sup>

43. I must remark here, that the instances given above, belong to a fact which is general throughout these mountains, and which as it is very striking, and seems capable of throwing some light on the mode of their origin, ought not to be passed over. It is this: wherever the separating ridge of two river vallies approaches the banks of one of them, there is its highest point; and where it holds a middle course for any distance, it is there found to be lowest; equally throughout the higher and the lower mountains will this remark be found to hold good, nor am I aware of a single exception to it.

44. But it is chiefly as snow-clad summits on the border of the Torrid Zone that these mountains have attracted attention. It is probable that but for this phenomenon, their elevation would have remained to this day a desideratum. To the inhabitant of the plains, who being under a summer temperature of nearly 100°, is exhausted with heat, it is certainly a phenomenon full of wonder. To those too who consider the heat to be in the sun's rays, (the bulk of common observers,) the wonder must be greatly increased, as the summit of the mountain is nearer by five miles to the sun than the plains at its foot; even the scientific observer cannot entirely divest himself of that feeling of admiration, which the sight of any thing so unusual to his common ex-

depth and extreme narrowness, are very striking. M. Humboldt mentions several of these, one of which though it be not 3,000 feet across, is yet upwards of 4,000 feet deep. Captain Hall too, notices the depth and steepness of the ravines or *quebrados of Chili*.

<sup>26</sup> But as these mountains are elevated on the high plain of Quito, which is elevated farther above the sea than the top of the Pyrenees, and constitutes more than one-third of the computed height, they are inferior in actual elevation to Mont Blanc. See Rees' Cyclopædia, Art. Andes.

perience, however agreeable to the deductions of science, must necessarily excite.

45. It is this phenomenon which has always occasioned them to be objects of attention, and it is singular enough that it is also on erroneous considerations connected with this phenomenon that the doubts of their superior elevation have been founded. I shall include under the remarks on climate, what I have to offer on the theory of the subject and the arrangement of the Isothermal bands. I shall here confine myself to a statement of a few of the most interesting particulars connected with the occurrence of this phenomenon.

46. It will be readily understood, that according to the season of the year, the zone which is marked by snow will be of more or less extent. If we take our estimate in that month in which the quantity is a minimum, and after which there falls more than melts, we may satisfy ourselves that a belt of ten to fourteen miles in breadth is distinguished by this phenomenon. It is not meant that snow lies in every point of this tract, but merely that within it will be found summits bearing snow all the year round. The minimum elevation of this snow-bearing tract is nearly in round numbers 15,000 feet, which may therefore be taken as the elevation in this latitude of the curve of perpetual congelation. There are, however, many spots of greater elevation perfectly bare of snow, this fact is, however, connected with a different arrangement of the seasons, and will be noticed in the section on climate. At all elevations exceeding the above, where snow lies, it is generally quite firm, except immediately after a fresh fall.

47. Many parts of this zone have such a disposition of the surface that it is quite impossible that any part of the snow which falls should ever be lost, except by melting, or by evaporation. The loss from the former cause must be very little at elevations much exceeding 15,000 feet. At 18,000 it must nearly cease altogether. The loss from evaporation will doubtless be considerable under so rare an atmosphere, still however we may safely conclude, that a surplus is left every year to accumulate. In favorable situations, we may imagine then the depth of these snows to be very great. In fact, we may suppose a case, without hazarding any improbability, where they have been yearly increasing since the origin of these mountains. Such supposition is calculated to give us a stupendous idea of the magnitude of these deposits.

48. We have seen that the line of greatest elevation intersects instead of bounding the river districts (Art 30). On each side of this line to the north as well as to the south the peaks diminish in elevation, yet not equally. To the southward the decrease is more rapid, and is accompanied by an anomaly which is sufficiently striking. The diminution of elevation, which is pretty regular till near the boundary of the plains and mountain land, is there suddenly interrupted. The peaks shoot up considerably above the mean elevation of those immediately north of them, and as suddenly sink into the plains; so, that if we divide the country, south of the line of greatest elevation, into five parallel zones, the fifth will be as high as the third, while the fourth will be found considerably lower than either.

49. Some of the most remarkable instances of this fact are the following: The Ghagur, which rises above Bhumowree, has one of the lowest of its passes, in a road distance of fifteen miles, elevated 7,121 feet above the sea. Another instance may be seen in the high range south of Sreenugger. A third in the Soorkunda range, as connecting that peak with Bhudraj. The latter overlooks the Doon, the former is but fifteen miles from Dhera, situated in the centre nearly of the valley, yet their altitudes are respectively 7,510 and 9,271 above the sea. The Jamoo Peak is another example. The Bhoora Peak a still more remarkable one. The latter elevated 6,439 feet above the sea, appears actually to overhang the lower hills which form the transition from its foot to the plain country. Many more instances might be adduced, were it necessary to multiply the examples. If a surface be supposed, such as to represent everywhere the mean elevation, that surface will not be inclined regularly plane, but will have a considerable curvature.

50. Another curious feature in the physical structure of this mountain tract is the situation of the high peak called the Choor. Its summit is elevated 12,149 feet above the sea, and if it be made the centre of a circle of sixty miles diameter, the circumference will on one side just fall on the common boundary of plain and mountain land, while within this circle, no point will be found within 15,00 feet of this height, and even those mountains which approach this limit, are, strictly speaking, part of the chain of which the Choor is the highest peak. From whatever quarter it be approached, it will be seen from very great distances standing up above the surrounding ridges like a huge beacon,

at once remarkable for its superior elevation, as for its peculiarity of form. The investigation of its geological structure must, for these reasons, be found very interesting.

51. Of the several rivers and streams by which the drainage of the Gangetic basin is effected, some have their origin from the Indo-Gangetic chain, that is, from the farthest side of the snowy zone, others spring from various points within that zone, or from its southern face, and a third class from the lower mountains where snow only rests a few months in the year. To the first class belong the principal sources of the Kalee and Ganges Proper, the Kalee, the Dhoalee, and the Sooree, branches of the former. The Dhoalee, the Bishun Gunga, and the Jahnuvi of the latter. To the second class belong the subordinate branches of these two rivers, and the principal ones of the Jumna, that is to say, the Ram-Gunga and Surjoo (Kalee); the Pindar, Mundaknee, Kalee, Bhillung and Bhageerethee, (Ganges); and the Beraee Gunga, Jumna, Soopin, Roopur, Pubbur, and Andryttee (Jumna). To the third class, which is the most numerous, belong all the other branches of these rivers, but six of them only require mention, as being at all remarkable. Of these, three pour their waters into the principal stream within the mountains. These are the Luddeea which joins the Kalee, the Nyar which belongs to the Ganges, and the Girree a branch of the Jumna. The other three have a considerable course within the plains. The Cossillah and Ram-gunga join a little below Mooradabad, and with the united stream, eventually contribute to swell the waters of the Ganges. The Murkunda, the third of these, loses itself, it is said, in the sands of the Desert.

52. Amidst so many branches, it may seem difficult to fix on that which is entitled to the pre-eminence, and to be considered as the principal source of the river. If, however, we recollect that the most distant source must be the most elevated, and must have contributed the largest supplies, we shall have a principle of selection, easily applied, and which leads to some curious results. In particular, it will appear, that the Soopin is the parent stream of the Jumna, and its source must therefore be the principal one. Of the Ganges, neither the Bhageerettee or the Dhoallee, so long considered rival sources, is entitled to that distinction. In reality, the Jahnuvi is the most distantly derived of all its branches, and must therefore be admitted to be the real source of this great river. Singularly enough too, of all the mountain rivers, this is the only one

that has not been traced up to its origin, owing to its being within the limits of Chinese authority ; the conclusion then is inevitable, that however we may pique ourselves on having visited and fixed the sources of the Ganges, the position of its most elevated and distant source is still a desideratum. Nor has the first beginning of this mighty river been yet beheld by European eye.

53. The following Table gives the particulars from which the foregoing conclusions have been drawn. It exhibits the distance, in miles measured along the river's course, of each source, taking as the point of departure, the place where the river enters the plains.

Name of Branch.					Dist. of	River
					Source.	Basin.
Kalee, ..	..	..	..	..	180	Kalee.
Dhoalee,	..	..	..	..	180	
Gungeea,	..	..	..	.	165	
Ramgunga,	..	..	..	..	127	
Surjoo,	..	..	..	..	143	
Dhaolee,	.	..	..	..	225	Ganges.
Bishunnunga,	..	..	..	..	202	
Jahnuvi,	..	..	..	..	233	
Pindur,	..	..	..	..	203	
Mundaknee,	..	..	..	.	150	
Kalee, ..	..	..	..	..	143	Ganges.
Bhaergettee,	..	..	..	..	203	
Bhillung,	..	..	..	..	150	
Jumna,	..	..	..	..	123	
Bheeraee Gunga,	..	..	..	..	124	
Tonse (Soopin),	..	..	..	..	154	Jumna.
Pubbur,	..	..	..	..	150	
Roopur,	..	..	..	..	143	
Andryttee,	..	..	..	..	145	
Sutlej,	..	..	..	..	555	Sutlej.
Cossillah,	..	..	..	..	100	Kalee.
Ramgunga,	..	..	..	..	105	
The Ludhee to its confluence,..				..	52	
Nyar, ..	..	..	..	..	82	
Girree, ..	.	..	..	..	112	

54. The sources of these rivers which spring in, or from, the Snowy Zone, are elevated from 10 to 17,000 feet, the first being that of the Jumna, the latter of the Sutluj, the two extremes. There is evidently some connection between the length of a river course and the elevation of its source. I find from a comparison of those which flow in the same direction, and which may be consequently supposed to have the same declivity, that the height of the source above any given point is as the square root of the distance from that point. Thus the Jumna, Kalee, and Bhagerettee are respectively elevated above the points where they enter the plains, 9,573 feet, 10,593 feet, and 12,776 feet, which results are as the numbers 10, 11, 6, 12, 9. Their distances from those points are 123, 143, and 203 miles, the square roots of which are as the numbers 10, 11, 1, 13, 3, differing by less than unity from the preceding.<sup>27</sup> The Sutlej will not bear a comparison with these, because its course is in a different direction, and has not consequently the same declivity. In the direction of its course, its great length, and the little aid it derives from accessory streams, it forms a strong contrast to all the other mountain rivers.

55. A feature common to all the water-heads that belong to the Snowy Zone, is their situation always in a comparatively open and level spot, with an accumulation of snow resting against the base of some lofty peak, from which the embryo stream derives its first supplies. According to the season of the year, the snow-bed will be of greater or less magnitude and depth. During many months, the place will be deep in snow, and unapproachable. After the snow begins to melt, a constant moisture is kept up for many months, while in the fine season again, vegetation goes on luxuriantly. The consequence is, the formation of a thick coating of peat, which is invariably found at all elevations, having a temperature such as to ensure during several months the slow and gradual melting of the accumulations of snow that occur during the winter. From 11,500 to 13,000 feet, according to locality, may be considered as the height at which peat will be found. It is always however

27. This law is not applicable to different parts of the same river's course, and yet it gives very near approximations in the case applied. Thus if from the distance in miles of any source from the *debouche* the square root be subtracted, and multiplied by 882, the product is the height in feet above the *debouche*. This would give 12,221 feet as the height of the source of the Tonse. The result by the temperature of boiling water was 12,784

in greatest quantity, and of a better quality in such spots as above described; that is, in hollows; because the supply of water is more constant, and equally gradual.

56. The discharge of the four great rivers at their entrance into the plains, has not been directly measured, except in the case of the Jumna. It appears however reasonable to infer, that the discharge will be proportionate to the extent of country drained; in other words, to the total length of course made up by adding the several branches of the river together. This rule I found to hold in the case of the Tonse and the Jumna, the discharges of which I measured in 1819. Thus, their total lengths of course were as the numbers 1, 2, 6. Their discharges as the numbers 1, 2, 8. In adopting then this expression for the valuation of the discharge, and taking the Jumna at 4,000 cubic feet in a second, (which is within a few feet of the result I obtained in March 1819,) we shall have the following results:—

*C. F. in one second.*

Discharge of the Kalee at Bishin Deo,	..	..	4,800
Jumna at Badshahee Mahal, ..	..	..	4,000
Ganges at Hurdwar, ..	..	..	7,000
Sutlej at Ropur, ..	..	..	8,100

We see here that, notwithstanding the far greater length of course which distinguishes the Sutlej, (more than double,) it does not greatly exceed the Ganges in discharge. This is owing to the comparative narrowness of its basin, and its want of great branches.

57. Although there are no great vallies in the interior, (Art. 15,) yet along the common boundary of mountain and plain land, on a line parallel to that of greatest elevation, there are seen a series of small vallies, which are however unconnected with each other, and sometimes separated by a long interval. These vallies are always marked by the *debouche* of some great river, and there is doubtless some connection, in the origin, between them and the river systems. Although there is not a valley to every river, yet they are found along the whole tract at intervals, as far as Patna on one side, and beyond Cashmeer on the other. The occurrence of these vallies through such a distance, and so symmetrically situated, favors the idea which would attribute a community of origin, or at least connection in structure, to the whole of this tract of Alpine land.

58. Those belonging to the tract to which the present description is confined, are the Pinjore Doon or valley, the *debouche* of the Guggur; the Kyarda Doon, the *debouche* of the Jumna and Ganges; and the Pattee Doon, the *debouche* of the Ramgunga. They are all bounded, or separated from the plains by a low chain of hills, which is also a line of water-heads, and contains the sources of those streams which, engulphed in the tract immediately at their feet, afterwards spring up in the Teraee, occasioning the humidity of soil which is so characteristic of that tract.

59. The Dehra Doon, which is the principal of these vallies in extent, and probably the only one demanding a detailed description, is from the Jumna to the Ganges about forty-five miles in length. Its breadth is variable, being in some places scarcely ten, in others fifteen miles.<sup>28</sup> The surface is undulated, and has, in particular directions, a strong declivity.<sup>29</sup> Many banks or steps occur, varying in height from one to thirty feet. These generally follow the course of the streams, one on each side; appearing to have the same relation to them which the Kadur, or marshy lands of the plains, have to the rivers there. Their distance, or the breadth of the channel they mark, is very considerable even in the case of the smallest stream, and they exhibit the same variations in arrangement which the river banks in the plains do.<sup>30</sup> There is little question but that they have once been the beds of running water, however incapable the present streams may appear of filling them even in their highest floods.

60. The drainage of this valley is effected entirely by the two rivers, Asun and Sooswa, which rising within a few hundred yards of each other near the middle of the valley, run in opposite directions, the former to meet the Jumna, the latter to the Ganges. The fall of these rivers is considerable; the elevation of the source of the Asun being 2,148 feet above the sea, and its confluence with the Jumna 1,469 feet, being a fall of 652 feet in little more than twenty miles. The fall of the Sooswa in a course

28 The admirable new road made by the Honorable Mr. Shore, leading from the Keeree Pass through Dehia to Rajpoor, at the immediate foot of the northern hills, measures, I think, fifteen miles.

29 The base which I measured in the Doon in 1819, had a difference of level of 300 feet between its two extremities. Its length was about four miles.

30 That is to say, a steep bank is always opposed to a low shelving one. When both are alike, neither are observed to be remarkably steep or shelving.



of about the same distance is 948 feet, its confluence with the Ganges having but an elevation of 1,200 feet above the sea. The course of these rivers is parallel to the direction of the valley, and very near the South-western boundary, so that their supplies are almost entirely drawn from the Northern barrier of mountains. The numerous feeders which spring from these, all flow across the valley, shewing, that there is a considerable declivity also in that direction. In fact it is found, that from Rajpoot at the foot of the hills, the fall is regular to within three miles of the Kheree Pass, and amounts to 1,300 feet. Thence to the Kheree Pass is a rise of 618 feet. This line is that of the new road; it passes through Dhera cantonment, and very nearly, if not exactly, separates the two basins.

61. The range of hills which bounds the Doon to the Southward, is of peculiar aspect, and presents some very interesting appearances. The total depth of this belt in the widest part is about ten miles. The range is not intersected by vallies with sloping sides, as the great mountain tract is, but by the beds of torrents which are generally bounded on each side by perpendicular precipices, sometimes 500 feet in height. The ridges are extremely narrow, so as to bid defiance to any examination of them, except such as can be effected in the beds of these torrents. The line of water-heads which separates the streams which seek the Doon from those flowing plainward, does not hold a regular course, as compared with the general tendency of the mountain belt, being sometimes at the border of it, as at the Lal Durwaza Pass, sometimes nearly in the middle, as at the Timlee Pass. The former has been stated to have an elevation of 2,935 feet, the latter is only 2,339. The peaks do not rise more than 600 feet above these levels, so that 3,000 to 3,500 may be taken as their general height.

62. The appearance of this valley is highly picturesque, particularly in the neighbourhood of Dehra. The intermixture of cultivation, in which the fields are defined by hedges, with patches of green, over which are scattered fine groves of trees, the undulation of the surface, and its intersection by numerous streams, are features that might almost remind one of the scenery of England. The proximity of lofty mountains occasionally clothed with forests, in which the pine, oak, and walnut are conspicuous, gives a variety to the landscape, which viewed at a favorable season, is picturesque and beautiful in a high degree. The soil is gravelly,

yet to judge from the cultivation, far from poor; and though at present thinly peopled, and but partially cultivated, was once otherwise. The land revenue had dwindled down to 10,000 rupees, when it came into our possession. It is said to have yielded 80,000 in the time of the Rajahs of Gurhwal. Under the fostering care of the British Government, it will not be long in recovering its former prosperity. The principal difficulty appears to be the want of water for irrigation, yet this is an objection easily remedied, for with so varied a surface, and so many streams, water might at a trifling expense be conducted in almost any direction. Capitalists are wanting to undertake this and other improvements.

63. The Pinjore Valley is the next in point of extent. It has in parts a breadth of perhaps six miles, and its length may be estimated at about thirty. It is tolerably even in its surface, and the hills which bound it to the Southward, are of much less depth and of less elevation than those of the Dehra Valley, at its South-east angle, in the *debouche* of the Gaggur, a river which is lost in the sands of the Desert. From Tuxal the streams run in one direction towards the Guggur, in the other towards the Plassia river, a feeder of the Sutlej. Pinjore, the principal village or town, with a fort, of masonry, is elevated 1,819 feet above the Seebur, which is at the foot of the mountain, and near the separating ground of the two river basins is 2,402 feet above the sea. Munsie Debee, a temple in the plains, just without the Doon, is 1,263 feet. From these results an idea may be formed of its declivities. It is not so well cultivated as the Dehra Doon, though it appears to possess equal capabilities.

64. The Kyarda Doon is of less extent than the last, having in its widest part but a breadth of six miles, and in length being but twenty-five miles. This estimate of its length supposes it to terminate at the Pass of Ghatusun Debee, where it narrows so much as to be scarcely entitled to the name of a valley. From Ghatusun, the elevation of which is 2,500 feet, the streams flow eastward to the Jumna. To the westward flows the Markunda, which enters the plains under Nahun Siki, on the Ghuggur. It loses itself in the sands of the Desert, so that we cannot refer it either to the Sutlej or the Jumna basin. I have however considered it to belong to the former, and Ghatusun I suppose the lowest point of the Indo-Gangetic chain. Of the Pattle Doon, I cannot give any account, as I have never visited it.

65. About thirty miles north of Almorah, or a little west of north, there is a small tract of rather greater extent than those to be hereafter noticed, and more uniformly level in surface. It is watered by the Gaomuttee and its several feeders, a river which joins the Surjoo, one of the branches of the Kallee at Bagesur. These feeders are very numerous, and the glens in which they rise being broad, with a level terrain, form by their inosculation with the principal one, the appearance of a considerable tract of open and almost level country. From Koolan to Retora is a distance of ten miles, in all which line the surface appears to have little undulation. The forest is not too thick, and yet from some unexplained cause, the tract is unhealthy in a high degree, so much so, as to be in a great measure neglected, and allowed to run waste. The elevation of Byznoth, a temple of some sanctity on the Gaomuttee, and which may be taken as the lowest point of the valley, is 3,800 feet; the villages are situated chiefly on the lateral ridges which divide the several subordinate glens.

66. In the beds of the different rivers there are, as might be expected, various spots of a limited extent, and of sufficient evenness of surface to be always objects of interest to the cultivator, though from their smallness, scarcely entitled to the denomination of vallies. These spots generally occur in an advanced part of the river's course, and being therefore the lowest places in the mountains, are necessarily the hottest. In general they are fertile, yet are all considered more or less unhealthy, particularly at the breaking up of the rains; and when narrower than usual, so notoriously subject to the *awal*, or jungle fever, as to be entirely neglected; instances occur in the bed of the Surjoo and Kallee. But where the width is rather greater, or the surrounding mountains not too lofty, they form the most populous, the most productive, and the most beautiful spots within the mountains. The width is seldom more than half a mile, but the length is sometimes considerable.

67. The most remarkable instances of this kind may be seen in the bed of the Sutlej at Soonee and at Dutnuggur; of the Bhagerettee at Teeree; of the Aluknunda at Sreenuggur; at Pannae of the Western Ramgunga along nearly the whole of its course; of the Cossillah for a distance of ten miles; of the Benee Gunga for about the same distance; of the Buspa at Sungla; the Sirjoo at Kubrol, of the Gereee Gunga in a great part of its course; and in the Comoulda, one of the principal

feeders of the Jumna : several smaller streams are equally, if not more, remarkable ; and in general, similar level, and comparatively open, spots are found at the heads of all the rivers.

68. To this class also belongs the series of petty vallies to be seen in the neighbourhood of Pctorah, though not constituting the bed of a river. The largest of them does not exceed perhaps two square miles, but they are in such number, as to render that district one of the most productive, for its extent, in the mountains. They are generally connected by some narrow gorge, so that, in one quarter, a distance of five miles may be travelled in which the surface is almost perfectly even. The appearance of the country, owing to such a number of these local spots, and the consequent insulated situation of many of the peaks, is peculiar to that quarter, and very striking. In the neighbourhood of Dhooara Hath, about twenty miles from Haurel Bagh, a pretty extensive piece of tolerably level ground is to be seen, and similar pieces in the neighbourhood of the small lakes, which are to be seen about ten miles above Bhumowree, on the road to Almorah. With the exceptions here stated, (and their collective sum bears but trifling proportion to the total surface,) all is rugged and difficult, a succession of steep and lofty ridges and deep glens.

69. The lakes mentioned in the preceding article, constitute a feature in the physical description of this tract which should not be forgotten. They are, however, on a very small scale, compared with the grand system of mountains to which they belong. One of them, Bheem Tal, situated about ten miles above Bhumowree, on the Almorah road, is only 3,000 feet in length, by 2,400 in breadth ; the depth, however, is said to be very great. It is situated at the lowest point of the valley, about three miles in length, and at some distance from it appears a considerable pool, which is at present connected with it by a running stream, the intermediate ground being marshy, and covered with flags. These circumstances leave no doubt in the mind of the spectator, that the whole of this valley once formed a lake, and it might easily be restored to the dominion of the water, by damming up the outlet, which the present lake has found for itself. The elevation of this spot above the sea is 4,200 feet.

70. About five miles east of Bheem Tal, is another called Nynet Tal, having nearly the same extent. A little beyond this is a third, called Nakoon-ka Tal, and besides this, some others of much less extent.

Within ten miles of Jytuk, near Nahun, is another called Ren Kee Tal. It is in breadth about 400 feet, and in length, as measured by the perambulator, one mile and a half. In common with all the others it is said to be of great depth, and to abound with excellent fish. A pool at the head of the Tonse, called Resul Kee Tal, and thought by the mountaineers to be unfathomable, may also be mentioned. As likewise a similar pool at the head of the Dinee river, one of the feeders of the Bhageerettee. The waters of all these are perfectly sweet and tasteless.

71. Along the foot of the mountains extends a tract called Bhabur, which has been always I believe reckoned an integral part of the mountains, politically speaking; it is of considerable elevation, and is farther distinguished by an almost total deficiency of springs or running streams, excepting such as, issuing from the mountains with a large body of water and considerable force, make their way through it without having their waters engulfed.

72. It is bounded to the southward by a line of springs or water-heads, which is also the northern boundary of the tract called the Terrai, one equally distinguished with the former from the southern plain country, but occasionally annexed to it and occasionally to the hills. This tract is remarkable for its moisture, as the other is for its dryness. Water in the driest season, (March 1826,) is never more than thirteen feet from the surface, generally much less. It is intersected by numerous streams, which with the inclination of the surface, affords such facilities for irrigation, as to render the tract, when fully cultivated, highly productive.

73. The Terrai is defined in its southern boundary by a rise or step, which runs parallel to the common boundary of mountain and plain land. This rise is a very singular feature in the aspect of the country, and forcibly impresses the spectator with the idea of some great catastrophe in which water has been the chief agent. The height is variable, and occasionally is as much as thirty feet, sometimes it is sudden or steep; and it is then intersected by ravines, the effect of floods in the rains; sometimes it is gradual, and it is then liable to be mistaken for an undulation of the surface; sometimes it consists of two banks or steps, and occasionally even of three; a similar step or break in the surface is found to accompany the course of each of the rivers after quitting the mountains. In this case, it forms the boundary of what is called the *khadir*, which as may

be understood from what precedes, is a low tract of variable width within which the river has its bed. These appearances correspond exactly to the banks described as accompanying the rivers in the Doon.

74. The Terrai may then be considered as a very shallow valley parallel to the direction of mountain land, and the *khadirs* or low lands of the rivers, as so many transverse vallies communicating with it. This itself is a presumption that the rivers have not formed their *khadirs*, but this is further established by the fact that the *khadir* is widest in the vicinity of the mountains, and diminishes as the river flows southward, till at no great distance it disappears altogether. At Bhogpoor on the Ganges, the *khadir* is of great width, yet in the highest floods in the rains, the river never rises to its level. At Durra Nuggur, the *khadir* is from five to seven miles in width; such a valley could never have been scooped out by the stream which now flows there.

75. The Terrai being thus distinguished by a fall or step, is usually considered very low in comparison with the low country south of it. Such however is not the case, although so strong is the deception in looking at the face of the country, that few people can be persuaded of the truth of the matter. Yet a little reflection would be sufficient, without any thing like measurement, to shew that it is a deception. The streams which take their rise at the foot of the Bhabur all flow southward, with banks of nearly equal height, and currents of considerable force. And from the Bhabur, which is so high as to be visible to the eye, there is no sudden descent to the Terrai, the line of demarcation being traceable only from the presence or absence of the springs, or from geological considerations connected with the nature of the deposits.

76. The preceding will, I hope, give some idea of the physical features of the country I have undertaken to examine, without which the geological description must be in a great measure unintelligible. The two classes of facts are so connected, that it is impossible to separate them; each throws light on the other; and if we wish to trace those general relations which furnish the highest and most interesting discussions in this new science, we must begin by taking a clear, as well as comprehensive, view of the physical aspect and arrangement of the surface.

77. It is my intention to give in the first place the simple geological details as observed, in order that a clear idea may be had of what is ac-

tually known, as distinguished from what may be considered matter of opinion or inference, subjoining an attempt to combine these details into something like a systematic view of the general structure of the tract, adding such inferences and illustrations as have occurred to me in reconsidering the subject. In the geological details, I shall follow out the extent of each rock as yet observed separately, and in the order in which they actually occur, beginning with the highest zone, and descending gradually to the plains.

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## SECTION II.

### GEOLOGICAL DETAILS.

78. In the zone of the Himmalaya, the only rock which I have yet observed, I mean as covering any extent, that is, as constituting a formation, is gneiss; other rocks are found it is true, but only in the form of veins or beds. Gneiss has been traced from Deao, opposite Muzzoolea near Seran in the western corner of the Survey, by Brooang in the valley of the Buspa, and thence ascending to the Snowy Pass of the same name, leading into the valley of the Pabur. In this line the varying level, (5,500 to 15,000 feet,) leaves no doubt of the great thickness, as well as lateral extent of this formation. It is not, however, every where equally obvious, the coating of debris being often of great thickness and covered with luxuriant vegetation. Frequently the only trace of its occurrence consists in large angular blocks lying on the surface or imbedded in the coat of debris. This may perhaps be considered inconclusive evidence of the existence of this rock as a formation, but the case admits of no other, and the same difficulty meets us at every step in these mountains, and as no fragments or any other traces occur, or any other rock in this tract, with the exceptions I shall presently mention, we shall find a difficulty in saying what rock is found below the surface, if we find it necessary to deny the existence of gneiss.

79. This rock is of the most ordinary character in the greatest number of instances, consisting of quartz, felspar, and mica, and nearly in the usual proportions. It seldom contains any foreign imbedded mineral. The felspar is almost always white, seldom grey, and only

in one instance of limited occurrence have I observed it of reddish hue. The quartz is most commonly white and semi-transparent, occasionally grey; the mica is of all shades, varying from silver white to a deep brownish black; some specimens contain both extremes of colour.

80. There are three distinct types of structure in this gneiss, two of which are well separated, both in appearance and position. The laminar which is often contorted, the granular,<sup>31</sup> in which the laminar structure is often obscure; and what may be termed the glandular. The first two appear to pass into each other, and to be irregularly mixed together, but the third preserves a great uniformity of appearance over a considerable tract. It has really the laminar structure as strongly marked as the first, but it is well distinguished from it by the imbedded lenticular, or round nodules of felspar which it contains, and which give it a most peculiar appearance. The laminæ are bent round these nodules, which have a foliated structure, and are sometimes disposed in two layers; the line of junction, which coincides with the axis of the nodule being so faint as only to be perceptible by the varying reflection of light from the two parts. There is very little doubt but this line of junction coincides with one of the faces of composition of the mineral, but I have not yet established this point to my satisfaction.

81. The dip of this rock appears involved in some obscurity; along this line, at least it presents some anomalies, the explanation of which I have yet to learn. This may be, nay doubtless is, partly owing to the frequent concealment of the rock beneath the coating of debris, leaving us in these cases to form our judgment from the configuration of the mountains, with reference to the sides of slope and precipice. Even this test sometimes fails, either from the great accumulation of debris completely modifying the superficial forms of the rock, or perhaps from the absence of definitely marked stratification. For even occasionally when the rock itself is visible, there occurs doubt as to this point, the fissures being so numerous and variable in direction, as to render it impossible to pronounce which are, and which are not the lines of stratification.

82. From Deao to Kungos, the dip appears to vary between N. and E.

31 By this term it is not meant to designate the granitic structure, but an aggregation of small grains, in which the difference of the felspar and quartz is often difficult to be ascertained.



being often N. E., and this on both sides of the Sutlej, the angle of inclination being about  $30^{\circ}$ . One measurement gave N.  $70^{\circ}$  E. But near Nichar, again it appears to be to the West of North, the inclination still much the same, or even less than  $30^{\circ}$ . A very remarkable rocky precipice occurs opposite this village, traversed by numerous rents and fissures, but nothing can be traced like marks of regular stratification; nor can even a line from the neighbouring strata be fancied to connect with any of them; yet from the appearance of the rock, I have not a doubt but that it is gneiss. Near Keelba, there is a considerable access to the rock, which is a perfect laminar gneiss, yet nothing like the regularity of stratification is observable in it either, the lines running confusedly in every direction.

83. At Woongtoo bridge, the stratification is also very obscure, and the natural divisions of the rock very various in direction, but as the laminar structure, which is, or ought to be, discriminative of gneiss is here often obscure, if not altogether wanting; the rock by many will perhaps be considered a granite. A few miles beyond this bridge, with an interval of distinctly stratified rock, a similar amorphous mass is seen on the right bank of the Sutlej, surmounted by regular strata of gneiss dipping S. W., but presenting that arrangement which has obtained the name of wedge-shaped strata; the upper layers approaching more and more to the perpendicular position. On this side (the left bank) is a similar mass of gneiss, but with an opposite dip, (that is to N. E.), and with the same arrangement, the inclination of the lower strata being inconsiderable, while the superficial are nearly vertical. This appearance struck me very much, coming on me, as it did, after a long and patient examination of the Woongtoo rock.

84. Beyond the irregularly seamed rock noticed as occurring near Keelba, we find a perfectly stratified arrangement continuing from a considerable distance, the dip pretty regularly N. E. and the inclination between  $20^{\circ}$  and  $30^{\circ}$ . This is the glandular type noticed article 8. On turning up the Buspa, below the village of Brooang, extensive types of stratification are seen, but with a S. E. dip, and an inclination of about  $25^{\circ}$ . This dip continues in the ascent to the Pass as long as any thing like stratification can be perceived. But in the last 4,000 feet of ascent, the rocks again put on the shattered and fissured appearance before described, and on the Pass itself, nothing like stratification can be traced, owing to the

intricacy of these seams, and the various directions in which they lie. But of the identity of the rock there can be no doubt, as I examined it along the whole of this line, and collected numerous specimens. It is a gneiss of the most perfect type. The Pass is strewn, as might be expected from the appearance of this rock, with huge angular blocks. I may add, that on the South side, a N. E. dip is again met with, but accompanied by a considerable change in grain, and a thinner laminar structure. This observation was made at an elevation of about 12,000 feet above this; all around, the ridges appeared with the same fissured and shattered aspect, while the river (Pabur) bed is strewn with fragments of every size, leaving no doubt that the rock is gneiss.

85. The only imbedded minerals I have observed in this tract are, 1. mica in tabular crystals, but not well defined, nor otherwise of any particular value, (near Seran); 2. schorl occasionally sparingly disseminated in small prismatic crystals (near Seran); 3. garnets of a lighter colour than usual, small and sparingly interspersed, their figure obscure if not imperfect; 4. quartz of bluish green color in six-sided prisms, occasionally attaining to the size of an inch in diameter, and two or three in length. They are found imbedded in a granite vein near the village of Keelba, but are with difficulty separable from the matrix. The quartz which forms the regular ingredient of this granite is of a light grey colour; 5. it is said that copper and gold were formerly obtained at a spot between Yancee and Keelba on the right bank of the river, but that the workings have been long abandoned.

86. Hornblende rock occurs in beds in the neighbourhoods to Sera, Tanada, and Kemgos. It rarely consists of the pure mineral, most commonly of a mixture of that and felspar. It is sometimes of a schistose structure, sometimes of that which I call the cleaveable. The two types appear to pass into each other by imperceptible gradations; in one case only, near Seran, could I perceive any thing like a transition or passage of the gneiss into this rock, the change in the other instances being sudden, and the contrast marked. These beds are generally of very limited extent, seldom more than a few yards, particularly between Deas and Suran, in which line they are also numerous. Near Tanada the bed is larger and occupies the whole of the mountain side, forming the ascent to the village. A bed of micaceous schist occurs near Sera, and one of compact quartz rock, forming a precipice of great mag-

nitude. At the confluence of the Buspa, the road lies along the foot of this mass, and is strewn with fragments from it.

87. Granite veins are evidently numerous in the neighbourhood of Wongtoo bridge, for among the fragments that are met with for several miles on each side, we observe a proportion of them to be granite. These fragments often present undeniable evidence of their veinous origin in retaining part of the gneiss which formed the wall of the vein, and it was this circumstance, combined with the low proportion they bear to the fragments of the gneiss, that first suggested the idea of their being derived from that source. But there can be no doubt on this subject, as in the immediate neighbourhood of the bridge, just before descending to the river bed, these veins may be seen in great number intersecting the gneiss, most commonly in a direction from N. E. to S. W., and again in the anomalous rock at the bridge.

88. The granite of these veins is always of a large grain, and is remarkable for the very large proportion of felspar it contains, the mica being comparatively deficient. The felspar is white and foliated, the quartz of a light grey, the mica generally brown. No difference of composition is observable between the middle and the sides of the veins, nor any change in the gneiss in its neighbourhood. The breadth is very various, and equally so the extent. The former is from a few inches to several hundred feet. They occasionally divide, but they cannot be said to ramify, at least not in a remarkable manner.

89. The rock which occurs at the bridge, and which contains the largest of these veins, is something of an anomalous nature, and might be adduced as an instance of that transition between gneiss and granite, which has been so often observed. Some specimens would certainly be considered to belong to the former title, while others might be chosen, which would as certainly be referred to the latter. It has, however, in mineralogical aspect, a strong resemblance to the more well-defined gneiss in its neighbourhood, while it has none whatever to the granite veins. I may add, that its occasional want of a distinctly laminar structure, and the indistinctness of its stratification, are the only obstacle to its being considered identical with the surrounding accurately defined gneiss.<sup>32</sup>

<sup>32</sup> It has been usual to call anomalous rocks of this description granitic gneiss, but the mere giving it a name affords no new information, nor in any way settles the doubt as to which type of rocks it should be geologically referred.

However this may be, I ought to notice that it is of limited extent in this direction, certainly not exceeding a square of 500 yards.

90. The band of gneiss thus traced out from a recent visit, may have its limits increased by a reference to notes made in a former journey. The particulars will not be so minute, and specially the dip and inclination are wanting, as an examination of the rocks was then a secondary object, and the subject not so familiar. But they will be sufficient to establish the great extent of the gneiss formation, and I ought to add, that of the few particulars I am to mention, there can be no doubt; as I made an ample collection of specimens which I afterwards examined at my leisure, with the opportunity of consulting those who were well acquainted with the subject.

91. On the Gonass Pass, five and half miles east of the Brooang Pass, (Art. 84,) and elevated 15,516 feet above the sea, the rock is a small grained, dark coloured gneiss, with the lamina rather indistinct, and often breaking with a conchoidal fracture. The dark colour is owing to the mica, which is black. The ingredients are most intimately mixed, and scarcely to be discriminated by the unassisted eye. In the descent thence to the bed of the Buspa, (about 9,000 feet,) the rock is seldom visible, but at Singlo (9,178), and thence in the ascent to the Harung Pass (14,500), the rock is gneiss. At Mibar (9,698), the same rock prevails, and indeed as far as Pooree on the Sutlej, between Pooree and Poorboonnee, a crumbly white granite is met with, the type of which, as far as my memory can guide me, is to be found in other parts of these mountains, and will be described further on (Art. 264). From a recent examination between Poorboonnee and Reeba, masses or beds occur, but of limited extent, of a rock, consisting almost wholly of felspar, generally in a state of decomposition. It is probably a granite. From Reba to Rispa is again well-defined gneiss, which on the ascent above Moorung, is exchanged for clay slate. The clay slate continues by Nissung to very near Dabbling. Just above Dabbling, a mass of granite occurs, the true relation of which I cannot attempt to give at this distance of time. From Dabbling to Shipkee gneiss prevails, the laminae and even strata frequently very much contorted, particularly at a precipice in the river bed between Doobling and Namja. Between Namja and Shipkee, it is imperfectly laminar, has a small grain, and is of a bluish grey colour. Beyond Shipkee, that is east of it, as far as it

could be judged of by contour, the mountains would appear to be clay slate.

92. To the north of Shipkee, between the Sutlej and the Speetee rivers, is gneiss, with some patches of granite, but whether veins or beds, must be left for determination on a future visit. This gneiss continues again by Nako to Shalkur, beyond which it is succeeded in the neighbourhood of Soomra and Laree by clay slate. We have thus traced gneiss very nearly to the confines of our possessions. In returning down the right bank of the river, we find it equally prevalent, the whole way from Shalkur to Woongtoo, with the following inconsiderable exceptions; limestone occurs in the bed of the Yoollung, which joins the Sutlej near Leoo, and again on the Hungrung Pass, (14,000 feet.) Whether these masses are connected, or form two distinct beds, must be left for future decision. Granite is found in the neighbourhood of Rarung, Meero, and Rogee: with these exceptions, and perhaps an occasional bed of mica slate and quartz rock, the whole of this line is gneiss.

93. The preceding account of the rocks of this tract, derived from recollection, agrees in the main with one published in the first volume of the Geological Transactions, new series, drawn up by Mr. Colebroke, from specimens forwarded by Captain Gerard, who also traversed that route. The chief difference is in my assignment of gneiss as the rock formation, giving to all the others, with the exception perhaps of the clay slate near Moorung, the subordinate character of beds or veins.<sup>33</sup> I may here add two other observations from that paper, which are not to be found in my notes, but are of importance. The dip is noticed at Pooaree as being E., and the angle of inclination 25° to 30°. The other is a notice of the rock found on the Shatool Pass, about five miles west of the Borunda Pass, and elevated 15,000 feet, which is stated to be gneiss.

94. We may now move eastward, and we shall find at the source of the Tonse (12,800 feet) gneiss again, of a dark grey colour, fine grain, and conchoidal fracture. This gneiss contains so large a proportion of

<sup>33</sup> It will be readily understood, that a series of specimens collected by a person not conversant with geological enquiry, whose attention too was strongly occupied by another subject, may well fail to exhibit the relative extent of each rock; such a collection can give us no assistance in discriminating insulated beds from alternating formations, or either of these from veins.

quartz, and is so hard, as to afford sparks; at Jumnootree, also the prevailing masses are gneiss; quartz rock also occurs, but in subordinate quantity. From Jumnootree,<sup>34</sup> a route passes in the bed of the Bhagheerettee at Sookee, reaching in two instances an elevation of about 15,000 feet (Bamsoora and Chaigu Pass.) The whole of this line is gneiss. From Sookee again, in the upper part of the course of the Bhageerettee, we met with scarcely any other rock; granite I have only seen in fragments. The snowy peaks at the head of this river are distinctly stratified, and have all the appearance of the neighbouring accessible gneiss. In the Jahnuvi, gneiss continues to Neeling, where it is succeeded eastward by clay slate. The valley of the Chor (thief) river, which is a feeder of the Jahnuvi, and springs from that point in which the Buspa also originates, but with an opposite course, appears to be also formed of this rock.

95. We have now reached the Kalee, (branch of the Aluknunda), and here the recent examination of this tract equally established the prevalence of gneiss, from Ookee Muth Joola (rope bridge) to Kedurnauth, the source of the river. In this gneiss the mica is often black, and the quartz glassy, and in one solitary instance if I am not mistaken, it admits of hornblende as an ingredient in addition to the other three more usual ones. The most marked varieties in structure or mineralogical aspect are the following: Near Nalaputtun, the laminae are undulated, the quantity of felspar diminishes, and I think it passes into a micaceous schist at length by the almost total loss of this mineral; beyond Mykunda, numerous fragments occur of the glandular type before described, and which is afterwards seen in Litee, in an immense precipice forming a beautiful natural section at the foot of the descent to Jilmilputtan. Some of the nodules have even a rounded appearance, similar to that of rolled pebbles; hornblende occurs in addition to the usual ingredients in specimens obtained between Mykunda and Ukrot Kothee. This rock is also remarkable for containing a peculiar mineral, which I shall presently have occasion to describe more particularly. Near Ukrot Kothie, it has all the aspect of quartz rock, exhibiting, what may be called, a transition into that congenerous formation. It gradually loses its mica, and appears at last to be a mere mixture of quartz and felspar, the fracture conchoidal and laminar, structure very obscure. Beyond Gowree

<sup>34</sup> Mr. Fraser, who traversed this route, gives the same account of the rocks, and particularly dwells on the stratified aspect of the lofty peaks.

Koond, occurs a type in which the nodules of felspar assume a lenticular shape. The ground being a dark grey, and this mineral of a snowy whiteness, makes it occasionally a very beautiful rock. Beyond Bhyro Ghate, the rock is scarcely accessible in situ, but the angular fragments, which are very numerous, are sufficiently indicative of its nature, and prove that the surrounding peaks and ridges are chiefly, if not wholly, gneiss. And the correspondence of appearance between the nearer ridges, which have evidently furnished these fragments, and the great Soommero or Kedurnauth peak attest the fact that here also, as at the head of the Ganges, this rock attains an elevation of nearly 23,000 feet.

96. The dip of this rock is more regular within this tract than in the neighbourhood of the Sutlej. In the bed of the river below Ookeernauth, near the Joola, it was observed to be from  $8^{\circ}$  to  $20^{\circ}$  N. E., while the inclination was  $30^{\circ}$ . Between Mykunda and Bhet, the dip was found to be twenty-five to forty-five N. W., and a little beyond this, due North. Beyond Mykunda again, it was observed  $50^{\circ}$  N. E. Beyond Borosa, it is also E. of N.; but the strata have a secondary set of divisions which are at right angles to the former, and consequently dip in the opposite direction. The first set have but little inclination. The latter are nearly perpendicular. This is an appearance often met with, and it is sometimes difficult to say, which are and which are not the stratiform divisions. Those have been generally adopted which correspond to the general run of the neighbouring strata. At the fine section near Jilmilputtun, the strata which are from four to ten feet in thickness, dip  $10^{\circ}$  N. E., at an inclination of  $30^{\circ}$ . After crossing the river, the dip is  $30^{\circ}$  N. E., the inclination the same.

97. The only beds observed are one of micaceous schist near Nalaputtun,—if this be not indeed a gneiss with less felspar than usual, and an instance of that oscillation which is observed between rocks so nearly allied in origin and structure as these two? It is remarkable for containing the largest garnets (common) I have seen in these mountains. Their figure is however irregular. The specific gravity I determined to be about 3.8. This is rather higher than the determination hitherto made, but I think it must be evident to any one, who will examine the uninterrupted series of gravities between common and precious garnets, and will also consider the variations in the analysis, that the former is

merely a more or less impure specimen of the latter. The degree of impurity may be estimated from the specific gravity.

98. Between Bhet and Mykunda, also, occurs a bed of micaceous schist under much the same circumstances as at Nalaputtun, that is to say, containing felspar in small quantity; the contact with the well-defined gneiss not being visible, so as to allow it to be ascertained whether it be a bed or a mere modification of the more general rock. Beds of hornblende rock are very common, but always of limited extent; as before observed, they seldom consist of the pure mineral, almost always of a mixture of that and felspar. Occasionally this rock, by the decomposition of the hornblende and oxidation of the iron it contains, acquires a rusty colour, and an earthy composition. In this case it is soft, and partially disintegrated. And a mass of a similarly disintegrated rock, but of a yellowish grey colour, is found in its vicinity. It is probably a decomposing gneiss. A rock something similar occurs again in the ascent to Gunness Ghata from Jilmilputtun. The composition is arenaceous, consisting of quartzose particles in a white earthy basis. This is also probably a gneiss, though from the absence of every thing like the stratified structure, I am more inclined to consider it a granite. But the name is of little moment; whether gneiss or granite, it is of limited extent, and being such as I have described, is surrounded on every side by gneiss. It does not contain mica.

99. No granite veins, unless the preceding can be considered one, were any where to be observed. But fragments of great variety, size and beauty may be seen in the small valley at the head of the river near which the temple of Kedurnauth stands; all these consist in great proportion of felspar, containing very little quartz, and much less mica; some want the mica altogether, some the quartz. The felspar is always white or grey, in the former case perfectly opaque, in the latter translucent. The quartz is generally grey, the mica sometimes a deep black. Those compounds which consist of the translucent variety of felspar and black mica without any quartz, are extremely beautiful, and could this rock be obtained in any quantity, it would pay for its transport. But the small quantity in which each type occurs, is equally remarkable with the great variety of them, and their total dissimilarity to the granites found in more southern localities. They are all angular, appear to be of recent fracture, and with those



met with near Wongtoo, (Art. 87,) doubtless portions of veins, as in many the same circumstance may be observed which was observed there, the adherence of part of the containing rock to one of the sides of the vein. This is always gneiss.

100. In the bed of the Mundaknee, or Kalee as it is more usually called, below Ookeernauth, many very large rounded blocks are scattered about, of a granite very much resembling the anomalous rock at Wongtoo bridge; it contains angular nodules of a crystalline felspar imbedded in a granite paste. This felspar is here of the glassy variety, and it is the only example of the mineral I have ever found. These blocks have a smooth surface, unlike the rough and granular appearance left by the phenomenon of desquamation to which granite is subject, and to which so many granite boulders owe their origin. If these boulders have been also formed by this cause, it is equally certain that they have undergone also the attrition, which alone could have smoothed their surfaces to the degree observed.

101. The only imbedded mineral of any interest in this quarter, is one occurring in small amorphous grains. It is of a bluish grey colour, translucent, a vitreous lustre, and uneven fracture. It is very easily frangible, hardness 5.5: 6.0. The composition is impalpable. The quantity I was able to procure was so small, that I do not lay much stress on the determination of its specific gravity which appeared to be 2.3. It is certainly not under 2.2, nor more than 2.4. Before the blowpipe it is infusible, but decrepitates. It is not affected by acids. This character does not agree with any mineral yet described, yet I should wish to obtain it in greater quantity, and subject it to a more leisurely examination before I pronounce it new, in all but geological situation and infusibility. Before the blowpipe, it comes very near the species, empyrodox quartz.\*

102. Some of the fragments of gneiss found at Kedurnauth, contain kyanite in flat prisms, from half an inch to an inch in length, and about one-twentieth to one-third of an inch in breadth. Cinnamon stone in grains is also to be found in them. The granite fragments abound in schorl, under its common figure of three-sided prisms,\* the lateral angles replaced, terminated by obtuse trihedral summits. The largest I observed, was about an inch in length and half an inch in diameter, but the small crystals are always best defined. Hyacinth is more rare, and the

\* MSS.

crystals, which are quadrangular prisms, terminated by quadrilateral pyramids set on the angles are very small, not more than one-twentieth of an inch in their largest dimensions. Carbonate of lime, (calcareous spar,) was observed only in one specimen.

103. In tracing this formation of gneiss eastward, we find it accompany us from the bridge under Ookeernauth, by Krokee and Oosaree, in the ascent to the Toongnath Pass, (10,000 feet.) Near Krokee, it contains the bluish grey grains described, Art. 101. At Oosaree it is chloritic, the mica having given way to this mineral. The quartz is rather in greater abundance than usual, which renders it rather a hard stone, and as the laminæ are very much undulated in the south wall, and the rock splits readily into masses of the required thickness, it is found valuable as a mill-stone, and is much sought after on the Pass. Well-characterised gneiss, of a small grain, and marked schistose structure, occurs. The dip was observed to be N. 20° E. It was particularly obvious in the arrangement of the mountain slopes and precipices. Fig.\* will give some idea of this appearance.

104. Beds of hornblende schist, as usual, are met with, sometimes in a state of decomposition, (between Krokee and Oosaree), sometimes persistent (on the Pass), but in a very small quantity. It is here succeeded laterally by chlorite schist, which also occupies a very small space, some very large masses of quartz rock are observed, which have evidently been derived from the lofty crest that crowns this Pass to the north. A small strip of granite of a middling grain and ordinary aspect, occupies the eastern edge of the Pass, and is I think, part of a vein. In the descent in the Pass no rock is seen in situ, but the fragments are all gneiss, and one type in particular is singularly beautiful, having thin prisms of kyanite dispersed through it in great abundance, thus giving it something of a porphyritic aspect.

105. The next locality within the elevated zone where gneiss has been traced, is at Dampa on the Gooree river. It was there observed under two types, interstratified with one another. The one a light grey, having much the appearance of quartz rock, the other darker coloured and larger grained, resembling the rock near Zanee on the Sutlej and

\* The figures referred to here and other parts of this report are wanting, for the same reason that has interfered with the preparation of the sections. They will be forwarded hereafter.—MSS.

Jilmilputtun on the Mundaknee. The two types are interstratified. The dip is very regularly N., a little E., and the strata are occasionally curved amongst the fragments, besides gneiss which constitutes the major part. Quartz rock was observed, and a few spots of hornblende rock, but none of granite.

106. From this point in the ascent to the village of Sacen, gneiss is the only rock observable. Thence descending to the Nullah, and ascending to the Pass called Chabinna-ka-Doorra, elevated 9,000 feet, the same rock continues, and in the whole line of so ordinary a type, and presenting so little new or anomalous, as to afford no room for description or remark. It yet accompanies us onward round the head of the Soorung glen to the Pass of Rooroo Dhooroo, elevated 10,000 feet; the line of route then descends to a Nullah, (elevation 6,000 feet). Gneiss the whole way. It ascends and descends, passing round the head of a valley, and finally crossing Sere Soongur Khan, a Pass elevated 10,000 feet, descends by Naneik into the bed of the Ramgunga, having yielded no rock but gneiss in all that line, not even a solitary bed. I ought however to notice that in a very great proportion of this distance the coat of debris is of an enormous thickness, and covered by a most luxuriant vegetation. In the bed of the Ramgunga, the dip was observed N.  $5^{\circ}$  W., the inclination being  $15^{\circ}$ . There were however two other sets of divisions, but not equally strongly marked.

107. The preceding comprehend the most northern observations of the extent of this rock. I shall now follow out its southern boundary, which as it presents some anomalies and irregularities, I have chosen to separate from the previous detail in order to avoid confusion, and to present in a clearer light the fact of the great lateral extent of this formation. I have not the least doubt, that a greater field of observation will establish the general prevalence of gneiss over the whole of what I have called the zone of the Himmalaya. It is true that this is mere opinion, but it is the opinion of one who has considered the outlines of the mountains with reference to their geological structure, and who may be said to have viewed the whole of it at greater or less distances.

108. I shall, as before, begin with the western parts, taking up my account at Deas on the Sutlej where, as I mentioned, gneiss occurs of a well characterised type. In the bed of the Nullah, between Deao and

Muzzooleea, may be seen a bed of chloritic schist. Dipping conformably with the gneiss it oscillates on one side towards talcose schist, on the other towards chloritic gneiss. The latter change is seen where it comes into contrast with the gneiss. This intermediate rock, as it may be called, is much intersected by veins of scaly chlorite in which quartz is also interspersed. The veins are very tortuous, and the quartz always follows the course of the chlorite. In the ascent to the Kutedorna Pass, just below the village of Darna, gneiss was observed, but of limited extent, and no other rock was visible.

109. Between this Pass and Putenoo I find no notice of the rock, owing I suppose to thick debris below Putenoo. In the route leading down that glen, one of the feeders of the Nowgree (to Roon on the latter river) chloritic and talcose schists are the only rocks observed, these rocks frequently contain quartz. The dip is generally north. The contact of the gneiss with the new rocks could not be discovered. In the bed of the Nowgree occurs an anomalous variety of talcose schist, or perhaps rather quartz rock. It is a mixture of silvery talc and quartz, but is not schistose, having more the amorphous aspect of granite. It contains, disseminated in grains, a mineral with the lustre of quartz, semi-transparent, varying in colour from a bluish white to an indigo blue. It does not appear to have any cleavage. The quantity was too small to determine the specific gravity. It is infusible *per se*. With soda it forms a clear glass. This rock has been met within very distant localities, and will be often referred to. At this place it is intersected by patches or veins of chlorite.

110. In the ascent from the Nowgree, fragments of a subschistose rock, of a greenish colour, may be seen, containing probably hornblende, besides chlorite; still higher on the pass above Birsoot, straight laminar chlorite schist prevails. In descending to the stream below Ketoo, the same rock continues, but having a fibrous structure; it contains nodules of quartz, and the chlorite is always observed to be bent round them. The dip was found here to be S. E. In the bed of the stream blocks of gneiss are seen, but no occurrence of it in situ. Chlorite schist continues to the foot of the ascent leading to the village of Koolior, when it is exchanged for a grey fibrous argillaceous schist, irregularly cleavable with a scaly granular fracture. The dip here was also found to be S. E. Probably this latter is in reality but a variety of chloritic schist. As long how-

ever as the green colour is made the discriminative character of chlorite, descriptive geology must notice it as a change.

111. This latter rock continues in the ascent beyond Teda, assuming latterly a magnesian character, and containing veins of quartz. The transition between magnesian clay slate, and talc slate with which chlorite slate is associated, is so common, as to render the above conjecture probable; masses of a rock which might be called quartz rock are then met with. It is of a fine granular composition and slaty structure; a little higher an enormous precipice occurs formed of the projecting ends of the strata, and facing the north. This rock is a gneiss of a grey colour, fine granular composition, and perfect schistose structure, and the dip, it would appear from the above, must be South on the Sulan Pass; again the rock is gneiss, but no observation of the dip could be made.

112. In the descent from this Pass to the village of Koornoo, so thick is the coat of debris, that not a single example of the rock is to be detected excepting fragments. These are gneiss; but from Koornoo the rock is finely exposed, particularly in the bed of the stream which leads from the bridge below Koornoo to the foot of the Pass above Surmal, and which here separates the Sutlej basin from that of the Jumna. This stream runs in a narrow gorge with high perpendicular walls on each side, formed of the projecting ends of the strata. These are observed on each side to correspond perfectly, not only as to the seams and directions of the strata, but also in the mineralogical character of the rock. This rock is an ordinary gneiss of a grey colour, and marked schistose character, the strata are sometimes five feet thick, and between them is a distinct separation or fissure; sometimes they are not more than six inches thick, and these changes occur within a very short distance, the dip is regularly S.  $40^{\circ}$  to  $50^{\circ}$  E. The inclination  $15^{\circ}$  to  $25^{\circ}$ .

113. In the neighbourhood of the Surmal village, gneiss is still found, occasionally, however, almost losing its felspar and consequently oscillating towards micaceous schist or quartz rock. The route from this village to Kuatar, at the head of the Nocor glen, leads along the high ridge which separates the basins of the Sutlej and of the Jumna. This ridge has an elevation in this quarter of from 7000 to 11,000 feet; some parts are above the limit of forest. It rises rapidly as it continues upwards, and is seen to be crowned with snow-bearing peaks at but a

short distance from the Pass above Surmal. It is generally covered with an enormous coat of debris and of peat, but the rock is visible in more than one place. It is gneiss, occasionally small granular, occasionally with bent laminae, and resembling the passage into micaceous schist. The dip is as often S. E. as N. E., nor did there appear to me any clue by which I could trace the connection of their opposite dips, which are many times repeated even in a very short distance. Beds of hornblende rock are frequent; this rock is very often quite amorphous, and has but little of any appearance of a schistose structure. It occasionally contains mica and even quartz, as well as felspar, and may thus be said to be identical in composition with the syenites, but it never loses the characteristic appearance of hornblende rock, and the above minerals are always in small quantity.

114. In the descent from the Kedrolo Pass to Kutar, the gneiss is latterly found to lose its felspar, and in the neighbourhood of that village it is an ordinary well-defined micaceous schist. From hence this latter rock continues in the bed of the Nocor river, lying at so low an angle that it is difficult to observe the dip or direction. I should have observed that the outline of the great ridge and its ramifying branches, from which the Kedrola Pass forms the descent, is peculiar. It is sharp and serrated, while that of the mountains east of Kutar, and even the branches of the former, as they fall in the scale of elevation, are observed to assume smooth rounded outlines, with scarcely any sharp peaks or breaches. But if the smooth ridge is seen to rise to any thing like the elevation of the serrated ridges, it also becomes serrated like them, while again on sinking, it takes the rounded form. This fact, combined with the low degree of inclination which the strata bear, would seem to justify in inferring the superposition of gneiss on micaceous schist, nor is there any thing so unusual in the fact, however contrary to a once generally received system, to occasion any hesitation in admitting the truth of it.

115. In the bed of the Nowr river, besides fragments of the mica slate, the rock in situ many large blocks are seen of gneiss of a type which I did not observe any where in this quarter in situ. Judging however from the connections of this rock in other places, I would infer that it must also be in abundance here, forming most probably those serrated crests which crown the mica slate ridges. This rock may be called a porphyritic gneiss. It is composed of rather a middling grained

paste, in which I believe the three ingredients are found, and in this paste are included angular nodules of crystalline felspar; this arrangement gives a very beautiful appearance to the rock when polished. It is the same rock which has been noticed in the river Kalee below Ookeemuth, and also at Wangtoo bridge. It appears very often to form the transition between granite and gneiss.

116. The micaceous schist continues to the village of Kohaen, situated below the foot of the Tekkar, but every where covered by a thick coat of debris. In the nullah the tendency of the dip was, if any thing, East; but here it was observed to be South-west. Below the village, a small stream joins the Nowr river. In the bed of this river, micaceous schist is still observable, but on crossing the river on the ascent to the village of Surmal, gneiss is seen resting on it. The dip of both rocks North-east, and the inclination very little. The mica slate has here a greenish colour, but it is not chloritic. The relations between micaceous and chloritic schist do not warrant, I think, our extending the latter title to those rocks of the former class, which have merely a greenish tinge. The lines of chloritic schists are rather connected with the talcose schists, a connection perfectly agreeable to our views of system, since it has been well established that the two minerals, talc and chlorite, are but varieties of the same species, (the prismatic talc mica of Professor Mohs.)

117. From Saraut to Seel, the route passes along the eastern declivity of the ridge which separates the Nowr glen from the valley of the Girree and its feeders. This ridge is every where of the rounded and swelling form which was mentioned as indicating micaceous schist, accordingly it is the only rock observed. It is frequently of an arenaceous composition, and strongly resembling some varieties of micaceous sandstone. This type occurs near the village of Kulgaon, occasionally it is of an earthy aspect, loses its schistose structure, and becomes fissured in every direction. This type projects through the surface in amorphous masses; it very probably contains felspar, though the grain is too small to detect it by any ocular examination. I incline to consider it as in reality a small grained decomposing granite, but further examination of its relations to the surrounding rocks are necessary to enable me to pronounce decisively.

118. From Seel to Deolara, the residence of the Ranee of Torbut, the route turns up the valley watered by the stream which joins the Pubbar

river, opposite to Raeengurh. In all this line, mica slate is the only rock occurring in situ. The dip was observed to be N. W., inclination  $15^{\circ}$ . Several very large fragments of gneiss may be seen near the village of Torbut; one which I noted, had the dimensions of 50 feet by 20 by 10. Whence these have come is not so obvious, for the crests of the range do not bear the serrated outline which is here discriminative of gneiss. Near the Deolora, the type consists almost wholly of mica, very tender, and of a yellowish brown colour. It contains numerous veins of quartz, as this type always does. The new road which has been cut by order of Major Kennedy passes through it, and is covered deep by the highly comminuted debris of this rock, the lightest and most transportable sand that is formed. The annoyance to the traveller's eyes in a light breeze is not to be described, while the sun strongly reflected from the lamina of the rock, occasions a glare which is almost as irritating to the eyes, as the subtile powder which is every instant blown into them.

119. At Seel, the rock is of the arenaceous type, and it contains, disseminated in great abundance, octahedral iron ore in small grains and imperfectly formed crystals. This mineral has a specific gravity of 4.81; but as there are some impurities in the specimen I tried, it is probable this determination is too low. The limits of octahedral iron ore are 4.8, 5.2, while those of axotomous iron ore, which it in some respects resembles, are 4.4, 4.8. But it is very probable that the true limits of the octahedral species, (magnetic iron ore,) do not descend below 5.0, for all the massive or larger crystallised specimens exceed this determination, and that the magnetic iron sand will form a distinct species between the axotomous, (titanic iron,) and the octahedral.

120. The abundance in which these grains are found, may be judged of by the specific gravity of some of the specimens of the micaceous schist in which they are disseminated. This was found to be 3.45. Taking 2.76 as the specific gravity of pure micaceous schist, and 4.8 that of the iron, it may be easily demonstrated that the latter constituted by bulk one-third of the rock, or by weight very nearly one-half.

121. In ascending from Deohea to the Pass of Chount Kagulla, leading into Poondur, micaceous schist alone is observable, but in general in the coating of debris thick fragments of gneiss occur, and it is probable



that the summits of this range are composed of this rock. On the Pass, micaceous schist is the rock; but it approaches in character to gneiss, containing I think felspar, though in small quantity. On the other side of the Pass, however, just at the edge of the steep descent, gneiss occurs in strata very nearly horizontal, the dip being if any thing North-west. This place, which is at the head of the glen in which is situated the village of Meemooa, presents some very romantic scenery. Immense precipices are formed of the columnar masses of gneiss, which here and there stand out from the general rock, and raise their gigantic heights far above the green knolls and patches of debris, enamelled with a thousand flowers that fill up the bottom of the glen. The crests of the surrounding ridges in which the gneiss is gradually lost being concealed by the luxuriant vegetation, are again crowned with noble forests, in which the yew, the horse chesnut, the oak, pine, and sycamore are all conspicuous. At every step the traveller disturbs the Moonal, (*Phasianus Impejanus*,) which with its shrill disagreeable cry forms the only interruption to the silence and solitude of the scene. It was a beautiful morning in May when I ascended it. The thermometer was only 50°, while in many of the secluded nooks, the springs were frozen. It is in scenes like these, and in such temperatures, that the explorer finds some recompense for the heat, and toil, and dust of less favored situations.

122. Descending into this glen, the gneiss is perceived to have considerable extent, and the valley for a still further distance, is strewn with huge blocks of this rock. At the precipices above described, a brownish tender micaceous schist may be seen resting on it; lower down in the bed of the nullah below the village of Mummora, the gneiss is finally exchanged for that rock, which here again appears to underlie it. It may be seen to form by the broken ends of the strata, corresponding layers on each side of the narrow water-course which it bounds, the two sides agreeing in mineralogical character, in inclination and thickness of strata so closely, that it scarcely requires an effort of imagination to fill up the very narrow chasms, or to join those masses which have evidently been once continuous. The micaceous schist continues in the high ridge on which the village of Pooree is situated, and for a few miles beyond it, when it is finally lost through the junction of the new rock, or is concealed by debris.

123. I have now traced the gneiss to its southern boundary in this direction, and have, in order at once to notice all the different patches of it that occur, encroached on the limits of the micaceous schist, the next rock in the order of description. But no arrangement of these observations can be entirely regular while nature herself so often presents us with irregularities, or at least what appear such in our imperfect systems. In fact the inconvenience is more imaginary than real, for in following out the extent of the next rock, the preceding details will be referred to as filling up part of the outline. No gneiss is found south of the point where the preceding description terminates.

124. It is necessary now to return to the route by the Borund Pass, in which gneiss was traced as far as the place of encampment in the Pubbur valley, about 10 miles above Janglag. The upper part of this valley, I should notice, is of great width, the left bank is steep and precipitous, consisting chiefly of bare rock, the river flowing at its foot. The right bank is an easy slope covered with a thick coat of peat, in which spring up at this season various European flowers, such as ranunculus, anemone, potentilla, iris, with many others that appeared new to me. Tracts of this nature afford the very finest pasturage during four or five months of the year. Very little rock is visible, only occasionally in the lateral glens, where the torrents from the snow have gradually made their way through this enormous mass of vegetable debris, and thus exposed it to view, or where a peak split by the expansive powers of the frost tumbles from its lofty base into the valley beneath, and scatters wide its fragments of every size. One such slip of very great extent may be seen on the road to Junglag, and of this all the fragments are gneiss; some pieces would afford hand specimens that might pass for granite, but viewing it in the large and almost innumerable blocks that lie here, the rock is readily pronounced a gneiss.

125. Descending from Junglag to the confluence of the two principal branches of the Pubbur, we find only gneiss. A fine section is exposed on the left bank of the eastern branch. It lies in distinct and well marked strata, from 5 to 8 feet thick, dipping to the S. E. The route continues along to the right bank of the united stream now swelled to a river, 40 feet wide and 5 feet deep. The coating of debris is of great thickness, but another section of the strata may be seen in

the bed of a small nullah that falls in from the west. The rock is gneiss, the inclination is small, and the dip obscure.

126. Hence, ascending and passing by the villages Dewtee and Sustwar, gneiss is still found projecting in many large masses; the mountain side being more steep, and consequently having less debris lying on it, no good observation of the dip was obtainable. Gneiss still continues up the lateral glen in which Kutsar is situated, and thence descending to Tikkaree near the latter place, fragments were observed of a dark blue colour and small grain, and in the eagerness to change the sameness of constantly recurring gneiss for some novelty, were supposed at first to be so, but the first stroke of the hammer corrected the mistake, and shewed it to be gneiss; a little unlike, however, the ordinary types of that rock. In the bed of the Kutsar glen, blocks of the porphyritic gneiss before described were observed, some of which had all the characters of a gneiss.

127. From Tikkaree to Senowlee, a distance of nearly 16 miles, the route is in the bed of the river, and in all this line there is but one instance of the rock in situ being exposed. It is a fine grained grey gneiss. In the bed of the river, fragments of all sizes are seen, but they consist almost exclusively of gneiss and quartz rock, some few of hornblende rock, and a very few of granite. The river bed is often wide, and in these cases is accompanied by a bank or flat of some extent, consisting of rounded stones. This bank is often 30 feet high, not less than half a mile in length, and 200 yards perhaps in width. These level spots are all cultivated, and it would appear, that they are particularly fitted to the culture of the poppy, which is carried on in this valley and its ramifications with great success.

128. This was the first instance of these beds observed in descending from the source of the river. Near Massoolea, where there is much level ground, occurs an immense accumulation; a lateral torrent which cuts through it to join the Pubbur, shews at once its enormous thickness and its composition; stones of every size, from 2 feet diameter to the smallest pebbles, all perfectly rounded, imbedded in gravel and sand; most of them are quartz rock, perhaps two-thirds of the whole, the other third consists of gneiss and hornblende rock, with a few of granite. These beds are so far different from the open level spots found in the upper part of the river vallies, in as much as their surface

is perfectly flat, while that of the others is rather undulating and irregular. The latter too are composed almost wholly of angular local debris, covered with a thick deposit of peat, while these, as already described, consist entirely of rounded fragments which project often at the surface.

129. From Sinowlee the road ascends one of the ramifications of the Chag Sheel ridge. At the commencement of the ascent, micaceous schist is found of a dark blue colour, and splitting into very thin straight laminae. It is much stained with oxyde of iron. Gneiss succeeds to this rock, but in small quantity, and is again exchanged for a micaceous schist, with something of a talcose aspect, and of a lead blue color. This rock continues assuming more of the talcose character, and it is I think certainly a mixture of prismatic and rhombohedral talc mica with quartz. The laminae become undulated, and it abounds in garnets. A vein is observed parallel to the layers, the centre of which was either granular quartz or a mixture of quartz and felspar, the sides were marked by prisms of hornblende thickly and confusedly disseminated. Many veins of glassy quartz, both white and yellow, were observed, but so fragile that no good specimen could be detached.

130. The rock continues to the village of Chupar, containing frequently veins, if they be so called, of gneiss. The veins never ramify, and they are always parallel to the laminae of the containing rock; below Chupar gneiss is again found in mass, and beyond it again talco-micaceous schist, enclosing a vein similar to that described Art. 129, consisting of granular quartz or a mixture of quartz and felspar, with crystals of hornblende disseminated. This vein has a porphyritic structure, is a most singular rock, and affords by the definite nature of its character, a clue to the connections of widely distant masses. It will be seen hereafter of what common occurrence it is within this tract, and yet it is a rock I have never seen except in these mountains. The dip is pretty uniformly in this neighbourhood, N. or E. of N. wherever it appears unconformable, it is but for a short distance.

131. Beyond the talco-micaceous schist, one with straight laminae, containing garnets and oxydulous iron is met with. In descending from Bulor into a lateral glen, the glandular type of gneiss before noticed as occurring below Broang (Art. 80), and at other places, is met with, and in the bed of the stream is seen a talco-micaceous rock with

undulated laminæ. This rock is singularly hollowed out, whether by the action of the weather or by the dropping out of the loose materials of veins, that may once have traversed it, it is difficult to say, perhaps the former opinion is the more probable one; and yet as these hollows traverse the laminæ of the rock, it is not easy to understand why they should be subject to decomposition so partially.

132. From Murdal the rocks appear to be of an anomalous character. In proceeding along the declivity of the range which here forms the left bank of the Pabur river, there is an oscillation between gneiss and micaceous schist, the rocks occasionally assuming the type of the former, occasionally of the latter rock. The gneiss appears sometimes to contain clay slate as an ingredient, and in one spot of limited extent, is carburetted in a high degree, this modification was noticed, also as occurring above Gowree Koond, in the valley of the Kalee, (Art. 95.) In the bed of the stream below the village of Twalta, gneiss is found of a legitimate type, dipping to N. E. and having an angle of inclination of from 30 to 40°. This rock continues the whole way to the village of Dorchan, where may be seen some types of a granitic character, but viewed in all their relations, little hesitation is felt to class them as gneiss in general, this character only applies to small portions of the rock, and even there may be seen in the same continuous stratum to pass into the most ordinary gneiss, and often in a distance of a few feet. The laminæ of this rock are much undulated, and owing to the arrangement of the materials, it presents a striped appearance, the stripes following a waving outline. In some specimens, I observed the spangled mica at right angles to the laminæ, an arrangement that might too hastily be considered characteristic of granite, were it not borne in mind first, that they preserve their parallelism in layers, which the mica in granite never does; and secondly, that it is an appearance not uncommon in micaceous schist, as I shall hereafter have occasion to shew, contrary to the opinion of one of our first geologists.

133. In the descent to the Kotee gneiss accompanies us nearly the whole way dipping to the north or a little west of it, the inclination being but little. It is however seen to include a bed of magnesian clay slate, the approach to which is indicated by laminæ of that rock being contained in the gneiss. Adjoining the bed of clay slate, is one of quartz rock. The actual junction of these rocks is concealed by

debris. The change however takes place in the direction of the strata, and does not occupy 400 yards in lateral extent. The gneiss which succeeds the quartz rock continues as far as Gokul, a village in the same glen. In the ascent thence to the pass above Seras, the rock in situ is not observable; for a considerable distance fragments of hornblende schist are found, but not numerous; after crossing the stream a new rock is met with, which occupies some extent. It is a white rock of a saccharoidal aspect, occasionally so frangible as to crumble under the pressure of the finger, yet at the same time it has many and distinct changes, but nothing like a schistose structure. It is most probably a bed in the gneiss. It is composed evidently of talc and quartz or felspar, or both; some parts of it have so completely lost the mutual coherence of the particles, as to form apparently a bed of white clay; no doubt this would prove an useful ingredient in any attempt to manufacture a superior pottery.

134. On the summit of the Pass is to be seen a gneiss of an earthy character, and containing not only clay slate, as an ingredient, but carbonate of lime. Below the Pass occur fragments of chloritic schist, in such abundance as to justify the suspicion that there are extensive beds of it in the neighbourhood near; the village, a compound rock of an argillaceous character containing superadded carbonate of lime, imbedded pieces of quartz of a lenticular shape, and perhaps felspar; most probably the transition of the earthy gneiss above to an argillaceous schist; another specimen is a well defined clay slate with veins of carbonate of lime, chloritic schist of a dull green colour, and subgranular composition, united to the imperfect schistose structure, also occurs, after which quartz rock in all its types occupies the road in the descent to the Tonse River, and for some miles in its bed, proceeding upwards: when I say in all its types, I mean rather of colour than any thing else, for excepting in this particular there is no rock which possesses such uniformity of character, at least in this tract. It is sometimes bluish grey from clay slate, sometimes greenish grey from chlorite. Occasionally it is talcose, occasionally micaceous; the dip is pretty uniformly from N. to N. E. and the inclination from 25° to 30°; a very remarkable instance of the disruption of the strata occurs in the descent, something like that noticed Art. 94. The interval is also occupied by a stream, but of very disproportional dimensions. It is about

four feet wide and six to twelve inches deep, (15th of June after many days heavy rain,) the breadth of the opening from precipice to precipice is 200 feet, and the perpendicular depth about 100. The dip and mineralogical character correspond on each side, so as to leave no doubt that they were once continuous. The rock, as quartz rock almost always is, is one of great tenacity and hardness, and it seems very difficult to assign any adequate cause for the removal of so large a mass. There does not appear any dislocation or disturbance of the strata, nor any trace by which it can be judged, that the mass removed could have been the materials of a vein of less persistent character; many other instances of this kind will be noticed as I proceed in my description.

135. The Tonse is here crossed by a Sanga which measures 101 feet in the clear. The velocity in the middle of the surface was 12 to 13 feet per second, and the depth from 5 to 7 feet. These data give the discharge about 2000 feet per second. In the Doon before joining the Jumna it was determined to be nearly 3000 feet. In its immediate bed are found very large rounded blocks or boulders some even 3 feet in diameter. As in the bed of the Pabbur River, so here also they consist of gneiss, quartz rock, and hornblende rock. At the confluence of the small stream in the bed of which lies the road from Seras, there occurs a very extensive piece of flat ground, but whether it be composed of the boulders, and loose gravel noticed in the bed of the Pabbur is doubtful. Small deposits were however observed in the immediate bed of the river, having a thickness of 5 feet. The open and flat spots are very numerous in this part of the river's course, but of what materials they consist is rendered uncertain by the covering of vegetation, which clothes their slopes even to the water's edge.

136. From the bed of the Tonse the route proceeds up a lateral glen called Gurogar, from the village of that name, a very picturesque valley having considerable width, and much level ground in many different points of its course. The sides are sloping and covered with forest, which with the luxuriance of the vegetation spread over the floor of it effectually conceals the rock; in one quarter numerous fragments of quartz rock may be seen something of the character of the rock noticed in Art 129, as found on the ascent to Bouchakadhar. It contains talc, and is frequently very tender almost friable. They are scattered over a smooth grassy knoll, nor is it immediately obvious

whence they come. The mountains on this side have flat declivities, without any rock visible, and are covered with fine forests; on the opposite side, it is true they are precipitous, and appear to consist of this very rock, but as the river forms a deep chasm between, and not a very narrow one, it is not immediately understood how they should have fallen on this side: perhaps they had occupied their present place before this chasm was formed.

137. The valley widens considerably at its upper extremity, but constantly presents the easy grassy declivities, or patches of forest, which so entirely cut off all access to the rock. The ascent is easy to the Dharma pass, which separates this valley from that of the Koomoolda, commonly known as the Ramasera, (note, Sera is always applied to those vallies where rice may be cultivated.) The latter is a valley of some note, and is thought by the mountaineers, of these otherwise, rugged districts to be a smaller kind of *des*,\* but their praises and description of it are greatly exaggerated; there are several vallies in Kumaon and to the westward of greater extent. Its extreme width cannot be taken I think at more than a mile, and the length of the wide part, — miles; towards its mouth it narrows considerably, and the Koomoolda, the stream which waters it, finally joins the Jumna by cutting its way through a narrow ridge which lies transversely to the valley, and which has all the appearance of having once formed a barrier to its waters.

138. On the Pass were found fragments of quartz rock occasionally containing talc, and of chloritic schist. The latter rock with bent laminae and oscillating towards talcose schist, was found in situ half way down the Pass. In the valley again gneiss once more makes its appearance in very thin laminae, and dipping to north. This gneiss is very probably connected with the mass which rises up into the lofty peak Kedar Kanta, in the sides of which both the Gurogar, and Rama vallies have their origin; on crossing the valley quartz rock and chloritic schist are the only rocks to be observed, and of these even very little, owing to the arrangement of the surface and the deep deposits, either of debris or peat, which every where conceal the rock. One very large mass was observed consisting half of quartz rock, half of chloritic approaching to talcose schist, there was nothing like transition observable between the two substances, the line

\* The term applied by the mountaineers to the plain.



of junction being strongly marked; the quartz rock was perfectly amorphous, not a trace of schistose structure was to be observed, the laminae of the schist were considerably bent or undulated, it contained fragments of the quartz rock, some of which were coloured green, some retained their white colour; no fragments of the schist however could be detected in the quartz rock; this mass which appeared detached was surrounded by several smaller blocks, some of which were found to be quartz rock, some chloritic schist.

139. The route passes round the head of a second valley, which falls into that of the Kumoulada, and crossing the lateral separating ridge descends into the valley of the Bunal, another glen containing a good deal of level ground, though not equal to Ramasera or the Gurogar glen. In the descent above the village of Kande, gneiss was once more found, but down the valley, the mountains, at least their summits, appeared to consist of limestone; this gneiss was talcose, approaching to earthy, and it is again found below this village in the neighbourhood of limestone beds, and containing a bluish semi-transparent mineral in grains similar to that described (Art. 126.) Here the gneiss formation is finally taken leave of, being succeeded by talco-argillaceous schist.

140. We must now proceed to the valley of the Kalee, and trace the southern boundary there also. The former account stopped at Ookemuth on the Kalee. In a glen a mile south of it, is seen a schist full of those flat veins or circular masses of quartz which are so common in micaceous and argillaceous schist; this rock dips  $45^{\circ}$  NE., and has an inclination of about  $30^{\circ}$  to  $40^{\circ}$ . Between the villages Jukh and Oakee again, gneiss is met with; below in the bed of the river is a mass of calcareous tufa with vegetable impressions. It is of a light buff yellow colour, is rather porous with a semi-crystalline grain. It is a very pure carbonate of lime, and affords an excellent cement by burning, which was used for the stone temples erected one at Kedarnath, at the foot of the great Soomeeroo Peak,\* the other at Ookee Muth where the Raool, or chief priest, resides.

\* This temple is situated at the source of the Mundaknee, a branch of the Dhaolee, in one of those expanded vallies described in Art. 95. The elevation of the place is — and it is unnecessary to say that during many months it is deep in snow, and consequently not habitable. There is even no village within 15 miles of the place; it is rather larger than the generality of these structures, and is handsomely built of hewn stone.

141. Chloritic schist is seen again at Kandara in the Greenduala glen, which furnishes a middling sized stream to the Kalee ; beyond the chloritic schist-gneiss is again found near the village of Baroo, Amorphous patches of earthy granite may be observed, so soft and crumbling as to yield easily to the spade. On the summit of the Pass a talco-chloritic schist obtains, and continues to the mines at Pokree, fragments, however, of hornblende schist being scattered about in some numbers ; beyond this point no gneiss was observed in proceeding south ; we may therefore return to Mundal below the Toagnath Pass, where the account of this formation left off. (Art. 103.)

142. This village is situated in the high bed of the Dulalee river, which has its rise in the schist of the Toongnath mountains, and joins the Dhoalee just below Gopisur. The route leads down the glen to turn into the valley of the Dhoalee ; very little rock in situ was observed, indeed only one patch, which was of too little extent to say precisely whether it was granite or gneiss, the toughness being such as to set at defiance the hammer, and consequently prevent its effecting a fracture of the rock, so as to judge of its mineralogical composition. It was a roundish amorphous mass with a few irregular seams projecting but little above the surrounding surface, and thus, from its want of sharp corners, increasing the difficulty, occasioned by its toughness, of detaching a specimen. Fragments of hornblende rock, of quartz rock, and of gneiss, are abundantly scattered over all this tract. One block, probably part of a vein, was observed, consisting almost entirely of that variety of hornblende called actynolite ; part of the containing rock still adhered, being a fine granular mixture of felspar, quartz, and mica, the first ingredient in greatest quantity. The actynolite has rather a confused structure ; apparently large concretions formed of radiating bundles of prisms. The specimens obtained were not remarkable for beauty.

143. A more remarkable phenomenon was the occurrence of a huge mass, composed apparently of very similar ingredients to the secondary sandstones. It was a solitary rock which stood in the bed of the Dulolee, the top being covered with grass and shrubs ; strictly it might be called a conglomerate, containing many large boulders or rounded stones. The base was rather fine grained, consisting almost entirely of quartz sand, and apparently held together by the slightest

coherence. The friability and want of consistence of the substance, prevented the retention of any specimens, as they fell to pieces immediately on being detached, though the rock itself, of considerable size, seemed persistent. I am inclined to think it was merely part of a diluvial deposit and not a legitimate sandstone, no specimen of which I have ever observed in such a locality. In reality though the sandstones are often friable, and have little coherence, yet I have never seen any which exactly resembled this rock.

144. At Sikol, in the bed of the Dhaolee, I found large masses of quartz rock stratified, probably with great regularity, but the fissures of the strata so intermixed with cross cleavages, that it was difficult to separate them, and say which really was the plane of the strata. The colour of this rock was greenish, it is also seen near Masooa, rather a large village near the rope bridge by which the Dhaolee is here crossed. The dip was N. E., inclination about  $60^{\circ}$  to  $70^{\circ}$ ; close by the bridge it appears to pass into micaceous schist. Further on in the valley of the Mundaknee, it appears to pass into chloritic schist.

145. I must not leave the Dhaolee, however, without saying something of those great accumulations of boulder stones, the very sight of which strikes the traveller with astonishment, and forces him to admit the action of some great rush of waters. These diluvian beds are here seen on a scale, which sets at nought any theory that should derive its agent from the body of water at present occupying that channel. These deposits seem always to be found in those parts of the river's course where the valley widens considerably, at least it has been so in all the instances I have yet had to notice. In the immediate bed of the river, the fragments consist of two kinds, the one perfectly rounded, the other subangular. The rounded fragments consist of gneiss, granite and hornblende rock, the other of quartz rock and mica slate, the two latter being the rocks in situ in the immediate neighbourhood of the rounded fragments; these are of all sizes from boulders of four feet in diameter to the small grains of sand. That the river in its greatest floods, and in some particular parts of its course possesses the power of moving these stones, is certain, from the deep hollow noises heard every now and then. That it can do little more than merely move them is equally certain, from the fact of these boulders always occupying the wide parts of the valley. There are tracts here of a mile in length, and

probably 300 feet wide, (the depth is not known), consisting of these huge stones, great part of them now far above the reach of the highest floods. It is not to be understood, if they had been moved by causes still in operation, why none of them should have travelled a little farther.

146. Ascending to Sooralee from the bed of the Mundaknee, chloritic schist is found established, extending for some miles beyond the village to the foot of the Okrooree Pass, which separates the Purgunnahs of Budhan and Dussolee. It is as usual much intermixed with quartz rock; some specimens of a straight laminar structure have an emerald green colour, and an almost metallic brilliancy. This is a beautiful rock. On the descent from the Pass gneiss is found of a small grain, a very compact rock. The dip is N.  $80^{\circ}$  E. the angle of elevation  $60^{\circ}$ , hence passing by the village of Koon to Choptah, quartz rock and chloritic schist prevail irregularly mixed. The dip generally N. E., the inclination  $25^{\circ}$ . At Chobtah, they are exchanged for an earthy micaceous schist, which however must be of very limited extent.

147. Below this village, on the road to Jak, the rock is of a less definite structure, being an irregular mixture of dolomite and talc; sometimes the grains are small and the mixture intimate, sometimes they are larger, and the aggregation of a granitic character, *i. e.* each mineral perfectly distinct, though mutually impressing each other. These distinct concretions become so large, that each mineral may be found forming the substance of distinct blocks. This type of rock occupies but a small space, being found only on the right bank of the glen below Chobtah; on ascending the other side, fragments of a granitic rock are met with, but of peculiar mineral character. The ingredients appear to be a dark bluish grey felspar, quartz and talc, the grain is small, the rock exceedingly tough and hard, with an amorphous structure, although some specimens shewed something like a transition into the schistose. This rock was not seen in situ, only in fragments, and has near been observed in any other locality. It is a very beautiful rock, and would be extremely ornamental if cut and polished.

148. Near Jak, beds of hornblende schist occur, apparently graduating into quartz rock; on the quartz rock, which contains felspar, rests a bed of chloritic schist of scaly composition and unctuous feel. These two rocks are perfectly distinct, and the line of separation strongly drawn. The dip is N.  $60^{\circ}$  E. and the inclination  $40^{\circ}$ . Below them is

the descent to the Pindar much quartz rock occurs, dipping always N. E., but having frequently a second set of cleavage planes equally distinctly marked. The only method of recognising them is the greater or less permanence, the false stratification if it may be so called, often vanishing within short distances. At the foot of a precipice formed by a beautiful natural section of a quartz rock containing felspar, is a patch of grey rock, amorphous, without any trace of schistose structure, and projecting in large round masses, very similar to those which granite is seen to affect. It is probably a mixture of hornblende and felspar. A whitish rock of a small grain, and similarly amorphous, is seen in contact sending veins through it, and reminding one strongly of the description given of granite veins. This white rock is similar in mineralogical character to the stratified rock above noticed, consisting of a mixture of quartz and felspar. The fragments in the bed of the stream are chiefly gneiss and hornblende rock; they are frequently increased by calcareous spar.

149. On descending into the valley of the Pindar a greenish grey schist is met with at the rope bridge. Character intermediate between hornblende and chloritic schist. It probably belongs to the former title, though the fragments and other indications beyond this place point to a formation of talcose schist. Fragments are also met with of gneiss and of hornblende schist. At Zubburkat, the rock is a gneiss, of a fibrous columnar structure, dark grey colour, and earthy aspect. It probably contains, if not hornblende, some magnesia or a mineral, probably talc or chlorite. It also contains grains of the blue semi-transparent mineral noticed (Art. 139.) Beyond this village immense blocks of a well defined gneiss are met with, resting on the mountain side, and some few of hornblende rock, but such is the thickness of the covering of debris and vegetable mould, this being the side of easy slope or quarter of the dip, that no instance of the rock in situ occurs till we approach the village of Chelinga; here may be seen a strata of gneiss, dipping N.  $85^{\circ}$  E. and at an angle of  $40^{\circ}$ . This gneiss agrees in character with that constituting the large blocks just noticed, and has an affinity to that seen at Zubburkat. It is a small granular mixture of black mica, greyish white felspar, and quartz, with distinct foliated grains of felspar superadded. The quartz is obscure, and indeed in all these mixtures of small grain, it is not easy to detect the nature of ingredients

so intimately mixed, without using some method of mechanical analysis, similar to that proposed by M. Cordier.

150. In the ascent from the village of Chelinga to the Goruldum Pass, no rock in situ is visible, but fragments of granite occur, of various sizes, strewed over a small flat at the commencement of the ascent. The source of these is not obvious. On the summit of the Pass quartz rock and chloritic schist, passing into micaceous schist are found in strata, the dip of which is a little obscure, but which seemed to be N. 60° W. Of the quartz rock, it is doubtful, whether it be not a transported block, but the schist is evidently in its place. On leaving the Pass in the descent to the village of Koolem, an earthy decomposing granite in amorphous patches is met with, of the same character as that noticed above Baree, in the valley of the Mundaknee, (Art. 100.) This rock is a very remarkable one, and requires a little detailed description. The proportion of felspar compared to that of the other ingredients is very great, and it appears to be singularly subject to decomposition, so much so, that the rock may be dug like a bed of clay or vegetable mould; the quartz and felspar, on a first appearance, form one uniform mass, in which, however, they are to be distinguished by colour, the quartz being greyish white and the felspar yellowish, and by their state of disintegration. The mica is of a dirty brownish green colour, and is disposed rather irregularly, as well as scantily. The laminæ are never parallel, a character by which it has been proposed to distinguish granite from gneiss, and which if it hold universally, will form an useful distinction, as being easily recognised.

151. On descending into the valley described in Art. 149, no rock is visible for a considerable distance, the soil being of great depth, and frequently overspread with forests. In the beds of streams however, may be observed occasionally the edges of strata, both hornblende schist and gneiss, and there are several patches of the decomposing granite also. In the ascent from Hath to Retorah villages, gneiss may be observed, at first of a very regular character, bluish grey, and strongly resembling the most legitimate gneiss of the Himmalaya. The gneiss appears gradually to pass into micaceous schist, which at Retorah is white, fine granular, and almost might be called slaty quartz rock. On the summit of the Hackena Pass, which leads into the valley of the Cossillah, it is of a dark greenish brown colour, very micaceous, and very

tender. The dip of the rock at Retorah was irregular, and the gneiss in the neighbourhood equally so, the strata having many undulations, but the rock observed in the bottom of the valley had a dip N. W.

152. Descending from this Pass quartz rock of an arenaceous composition is found. It contains beds of chloritic schist. Beyond this, near Mala, argillaceous schist becomes established, of great variety of aspect, of a purplish, greenish and light grey colour, straight, fissile, with rhomboidal cleavages, and of a soft consistence, comprising every variety almost of the brightest colours. It contains beds of limestone, which are often highly argillaceous. Farther down in the valley of the Cossillah, micaceous schist is met with, and then an extensive patch of gneiss, which stretches across the valley, and is probably connected with other masses shortly to be noticed. Afterwards the micaceous schist again re-establishes itself, and continues to Almorah. Here for the present we shall break off this description, and return to the route from Sacen, in which gneiss was traced as far as Naneik, and to the bed of the Ramgunga below the village, (Art. 106.)

153. The route proceeds by Ratik, gneiss accompanying us the whole way; some fragments of a very peculiar rock were found, composed wholly of a substance which might be called intermediate in character between rhombohedral and prismatic talc mica. It was of a dark brownish green colour, and the foliæ of the mineral were placed in every direction, having the appearance of a confused aggregation. The same rock occurs rather abundantly in the ascent to the Soor Doora Pass, but always in fragments, while the rock in situ continues to be gneiss as far as the village of Soor. Beds of hornblende schist, and of micaceous schist occur in the descent to the bed of the Sirjoo river; the gneiss being, however, the containing rock, and continuing to some distance beyond the village of Soope.

154. Here the rock begins to change, the gneiss appearing to pass into a fine grained mixture of talc and quartz, which may also perhaps contain felspar. This is succeeded by quartz rock, which again becomes talcose, and incloses small beds of talcose schist. It passes into chloritic schist also, the quartz becoming at first green. The latter rock contains veins of quartz, and on one a particular concretion of so remarkable a shape and appearance, as to have the strongest resemblance to a rib-bone. In endeavouring to detach it, the resemblance was des-

troyed by fracture. On the Pass of Chowr Bunaik, the talcose rock is fairly established, being occasionally schistose, occasionally amorphous or massive. It is of a white colour and beautiful nacreous lustre. Descending thence, various mixtures of this mineral, (prismatic talc mica,) with quartz, are found sometimes inclining to a green colour, and apparently allied to chloritic schist, sometimes to a blue, and passing into argillaceous schist. Alternating beds of the green schist and quartz rock were observed, very regular and well-defined.

155. In the neighbourhood of the village of Kurrimee, the rock is a mixture of white granular dolomite and talc. The latter is sometimes found in beautiful nacreous scales, disposed in nests or nodules, at other times intimately mixed with the particles of the dolomite. In the latter case, the rock is extremely friable, and resembles very strongly the dolomite of the Alps. This rock is succeeded by a schist of an argillaceous character, very soft and tender, and of a dark blackish grey colour. The schist is occasionally green in the ascent to Tobue Binag, where the view of the mountains discloses several beds of talcose schist of a whitish colour; descending to the village Bugur in the bottom of the glen, limestone is the rock. It is often very impure, being highly charged with argillaceous or siliceous matter. It is regularly stratified, dipping N.  $48^{\circ}$  E. at an angle of  $60'$ . The strata are sometimes curved.

156. This limestone continues in the ascent to the high Pass of Cheeoonga Binag, the whole of which ridge is composed of it. With occasional patches of schist of an argillaceous character, it still accompanies us by the village of Ingthana to Bynsaree, in the route down the glen in which those villages are situated. The strata are sometimes fissured and cracked in every direction, and in some cases so fragmentary, that large masses have fallen out, thus giving rise to extensive caves. From Bynsaree, the route passes up a lateral glen to Soomchala, crossing an elevated ridge. On this ridge and the immediate ascent to it, argillaceous schist is found of a reddish brown colour, earthy composition, and splitting readily into rhombohedral fragments. This rock is sufficiently exposed also in the descent to Soomchala, where it is remarkable for its many changes of colour, within a small space; as also for the rhombohedral cleavages passing into the straight schistose.



157. As far as Darimket, the route lies in a succession of glens, in which no trace can be found of the rock in situ at that village. It ascends, and immediately a talco-micaceous schist is met which continues to the foot of the descent into the valley on the other side. This latter is one of the many branches which fall into the great one of the Gaomootee, described, Art. 65, and as such, partakes of the open and level nature of the latter. At the foot of the descent fragments of hornblende rock occur in great abundance, and a little further, the rock in situ is found to be an earthy gneiss, extremely soft and crumbly. This rock continues to disclose itself in different parts of the river bed as far as Byznoth; and at the foot of the ascent to Retora a grey gneiss of very perfect character is seen dipping N. E. In the ascent to Retora, this route coincides with that described Art. 65.

158. We have now to take up our account of the gneiss at the village of Dampa, Art. 105 where it is described as of a remarkably regular type, and disclosing itself in extensive masses distinctly stratified. From Dampa to Munsaree, this rock continues, and near the latter place and above it, are enormous blocks of this rock scattered about in the wildest confusion. Thence ascending to the Betoolee Dhoorah Pass, the same rock is occasionally found, and occasionally beds of hornblende schist. At Munsaree there occurs a bed of a very beautiful rock, being a mixture of white granular limestone and talc, (prismatic talc mica,) the latter is occasionally diffuse. Amongst this the carbonate of lime occasionally occupies distinct layers, passing into the argillaceous schist. This rock furnishes excellent roof slate, being very fissile. In the bed of the Gurjeea river below Munsaree, the rock is an earthy brown, tender, micaceous schist in descending the bed of the Gurjeea, as succeeding to the gneiss.

159. Descending from this Pass, quartz rock occurs in extensive masses distinctly stratified, dipping N.  $15^{\circ}$  E. Other fissures at right angles, at distances of five feet, are extremely distinct, the whole mass being thus divided into rhombohedral or cuboidal masses. This quartz rock is seen sometimes plain, sometimes green from the addition of chlorite, and sometimes blue, probably from an admixture of argillaceous schist. On the Kalee Moonnee Pass and the descent to Girgaon, the rocks are rather of an anomalous nature, and comprise beds of very various and varying composition. Talc slate, yellow, white and blue

carburetted clay slate, blue ditto, talcose quartz rock, and talcose limestone are the most marked types, and they succeed each other in the most sudden and unexpected manner. In general, however, the formation may be said to have a talcose character, that mineral forming more or less of the composition of each rock, but I think that it is surmounted, or at least surrounded, by the same gneiss which accompanied us from Munsaree, and which appears in all the larger masses and the more elevated ridges. In the bed of the nullah below the village, rounded blocks of this rock are seen of an enormous size, which confirm the above idea. Beyond this point, it is not found till we approach Almorah, and the masses in that neighbourhood being connected with the granite beds there, will be better described when we come to the details of the latter.

160. The preceding comprises all my observations of the localities of gneiss within these mountains, with some trifling exceptions hereafter to be noticed. It will now be necessary to proceed to the next formation in the order of succession. It is of a schistose structure, but very variable in mineral character, comprising micaceous chlorite, talcose, and even argillaceous schist. My observations are not yet sufficiently multiplied to determine, whether all those schists form one member in the succession of rocks, or whether the three first are to be considered as most intimately related, and the argillaceous band as the distinct term in the geological series. Some anomalous appearances, which are inimical to the latter view, may perhaps be explained by the intrusion of the granite masses in the middle of argillaceous strata, but it would be premature at present to decide either way. We may for the more convenience of description, consider them all as members of the same formation, as each in its turn is conterminous with the gneiss.

161. Beginning with the most western route, we may take up the description where the micaceous schist in succession to gneiss was again exchanged for chlorite schist. Near Laké, the latter rock may be seen, though from its transitions it ought perhaps rather be called a magnesian clay slate, (talco-argillaceous schist.) It has a N.E. dip. It extends to the foot of the descent into the bed of the Salung river. There may be seen an impure limestone associated with a clay slate, the two rocks being found not only in alternate layers, but also occasionally intimately mixed in the same layer. The fragments in

the bed of this river consist of granite, gneiss, micaceous schist, and hornblende rock, all of them substances at present found in situ only at a considerable distance.

162. Ascending to Reowthul, numerous indications are observed of a limestone formation; clay slate does not entirely disappear, but the higher ridges in the neighbourhood, judging by the outline and general appearance, are evidently limestone. This rock affords one of the instances in these mountains in which disposition of form and colour is an unerring guide to the nature of the rock, forming a series of irregular terraces or ledges, the faces of which are always precipitous, and stained with black and yellow, the outline of the summit presenting a rather flat curve; it is impossible to confound the limestone of these mountains with any other rock. There is certainly a local physiognomy in rocks, if I may so express myself, which enables a person familiar with them, frequently to determine correctly their nature, from the mere view of the mountains in which they are formed. But there is no truth in the opinion that would extend these local phenomena to a wider sphere, so as to make them instances of a general law.

163. At Reowthul, there are several smelting houses for obtaining iron from a hydrated peroxide, (prismatic iron ore,) which is found in the neighbourhood. I had not time to visit the place whence the ore is obtained, but I examined the specimens of it which they had brought for smelting. It is a light scoriaceous yellowish brown crust, and very similar to deposits of the same ore which I have seen in other localities as originating in streams, permeating argillaceous schist, and strongly charged with ferruginous matter. The iron is said to be in repute.

164. From this village the route passes round the brow of the range to the Pass immediately above Surara, and in this line wherever the rock is seen it would appear to be limestone, with some trifling exception in the occurrence of a micaceous argillaceous schist. At Surara again, the rocks are all limestone, presenting that appearance so common to this class, of huge amorphous masses united to others often honeycombed or irregularly varied in surface or regularly stratified, or even schistose. Yet I would say on a large view of the phenomena, that this rock seems to be always most regularly stratified when most impure, and vice versa. Another appearance remarkable in this limestone is the aries

that seems to attack lumps small of it, changing the outer surface to the colour, grain, and consistence of chalk. This change is the more remarkable in a rock, which like this is of a blue colour, and possessed of considerable hardness.

165. In the descent from Surara to the bed of the Syrij river, limestone is the only rock seen, ascending thence to the ridge which forms the right bank the same rock prevails of a less pure type, and occasionally of a schistose structure. In the lateral glen in which the village of Ureea is situated, the rock appears to be mica slate, or a transition between that and clay slate; the limestone is in general impure; when otherwise, it appears to undergo that superficial caries already noticed. It must be rather an extensive bed, for most of the surrounding ridges were also observed to be composed of this rock, as recognised in its characteristic ledgy precipices. This limestone is also seen in the descent to the Bangur, and also in the bed of that nullah, distinctly stratified and dipping N. E., the reverse of the micaceous argillaceous schist near Ureea, which is S. W.

166. On ascending from the bed of the Bangur, an anomalous rock is seen, in amorphous patches of a greenish colour and considerable hardness, very possibly ferruginous quartz rock. A black type of the same rock occurs in fragments in the bed of the nullah, and with disseminated iron pyrites, (rhombohedral iron pyrites,) argillaceous schist then establishes itself, being occasionally of a magnesian character; occasionally (below Sookowlee,) of a micaceous. The route here passes over the several ridges which ramify from the Chandpoor peak, the rock of which is micaceous schist, and this line appears to be the junction of the two formations, to judge by the frequent transitions and oscillations. It may be observed, that the strata appeared pretty regular, and with exception of the rock at Ureea, appeared to dip conformably.

167. In the vicinity of Sokanda, the schist assumes a micaceous character. Near Dharee, limestone protrudes in limited quantity, and we have then the argillaceous schist with its usual variableness of character continuing to the bridge over the Tonse at Mywar. It is at one time a blue smooth laminar slate, (talc argillaceous schist,) again a fine grained slate approaching to compact (argillaceous schist,) which is succeeded by a fine grained greywacke, slate (micaceous

argillaceous schist). Just above the bridge, nodules of limestone are seen, but the rock appears to have no extent.

168. In the bed of the river, a very perfect type of argillaceous schist is seen, distinctly stratified, and dipping conformably. It passes into a rock, having the strongest resemblance to reunited angular debris. It is in this rock that the Uyar lead mines are situated. The rock is so soft, as to afford great facilities in excavation, but unless well supported by wooden framing, it is liable to the accident of falling; has happened more than once, and several miners have been crushed. The ore is a steel grey fine granular galena, (hexahedral lead glance,) and is often found in veins traversing quartz; it is accompanied by iron pyrites, (rhombohedral iron pyrites.)

169. At this place the river is crossed by a bridge formed of a single rope, on which a block with the passenger or baggage attached, traverses. It is a very tedious, though perfectly safe method of crossing a river. On the right bank about one and a half mile lower down is the lead mine of Mywar, belonging to Tounsar, one of the reserved districts. That at Uyar belongs to Sirmoor. At Mywar, the same ore is found and accompanied by the same minerals, and the containing rock is there also a clay slate, though occasionally very calcareous. The galleries are very numerous; in some, sulphur is obtained. In others, the vein is a blackish friable earth, in which the galena is in nodules.

170. The route to Borrela from this place turns back to the northward, ascending along the right bank of the river. In crossing the Ventijar, which here falls in the Tonse, argillaceous schist is seen in its bed in situ, while the round stones are all limestone. These boulders continue to the height of 300 feet above the bed of the river, and are united with a calcareous conglomerate, which is, however, of a very limited extent. Argillaceous schist is thence the prevailing rock, but mixed with occasional patches of limestone; above the village of Joktan the latter rock establishes itself in larger masses, constituting whole ridges, and extending with very little interruption thence to Borela.

171. It is in this rock, which in its lower strata appears to pass into argillaceous schist, that the lead mines of Borela are situated. The ore is in every respect similar to that found at Uyar and Mywar, and is also accompanied as there, by iron pyrites. The number of galleries here, as well as at Mywar, is truly surprising, and shews the perseverance of

these people, even with their imperfect means. They told me they were in number eighty, many of them of great length, and yet the village is small, and does not contain above forty inhabitants of every sex and age; but there are several other villages that have a joint proprietary right, the assessment being made on the small purgunnabs or hundreds, as they might be called, and not on the individual villages.

172. The limestone of Borela continues to Haje, with very little interruption, and through a varying level of at least 1,500 feet. It very often contains veins of a pure white calcareous spar, sometimes it is foetid, and then it always appears to be less pure. In this latter case, it is occasionally found to contain veins of white granular limestone, and not unfrequently also, to pass into a flint slate or schist. It has its subordinate and limited masses of local breccia, and conglomerate accompaniments, which this rock is never seen to want. It is a good deal intermixed with quartz rock, and has occasionally, as might be expected, a silicious character. With regard to its stratification, it is when at all impure, distinctly marked by parallel seams, and when pure, as often amorphous. This indeed is a remark I think universally applicable to limestone. A very remarkable curvature of the strata is seen on the ascent from the Mator nullah, which separates Haje from Borela; some indications of argillaceous schist were also observed here.

173. Near Haje, the rock may be called a well characterised argillaceous schist, which afterwards becomes micaceous. This is succeeded by a series of types of quartz rock of very various character. The most remarkable feature in this rock is the suite of colours it exhibits: grey, green, red, purple, and brown from the extreme shades, and in their transitions, a great variety of intermediate tints are produced. In general, it has a granular composition with considerable hardness. The structure is occasionally cleavable in three or more directions, occasionally it is subschistose. In the latter case, the rock is observed to pass into an argillaceous schist. In general, this quartz rock owes its colours to indurated clay, or a basis of clay slate, and it contains, superadded to this ingredient, scales of mica, never in any abundance. The composition is never of that decidedly granular appearance which distinguishes the sandstones; frequently it is evanescent where the proportion of quartz is a little less predominant. I think this rock might

be considered as a greywacke ; some of its transitions into argillaceous schist are doubtless entitled to that designation.

174. On the border of this rock, we find another of so anomalous a character, as to require some illustration from investigations in other parts of the line of strata. It consists principally of indurated clay and quartz, and contains grains of a green pellucid mineral, very much resembling some varieties of actynolite. It also contains mica in notable proportion. It is in fact one of the many aspects under which the above described quartz rock is found to vanish. I have sometimes thought that this rock has some connection with one occurring on the road from Bheemtal to Almorah, and which will be afterwards described. Like this, it is connected on the one side with quartz rock, on the other with clay slate. In this quartz it is succeeded by a small patch of slaty limestone, which speedily gives way to the prevailing rock of distinct argillaceous schist.

175. This schist presents a great variety of types, as may be seen on the road to Deao. It is sometimes compact, sometimes granular, often heterogeneous in composition. The granular types are seldom perfectly fissile, some not at all. In those which are so, the laminae are almost always undulated. It is further remarkable for the quartz veins by which it is intersected in every direction, not only in that parallel with the laminae of the schist, but also transversely, and in every possible angle of obliquity. These veins, as has been often remarked, never appear to interfere with, or disturb the arrangement of the parallel layers. In one instance, where dip has occurred, a bed of local debris (alluvium of descent) of fifty feet in thickness is observed resting on a highly carburetted type. It is not improbable, from this and other indications formerly observed, that graphite exists in this neighbourhood. I ought not to omit noticing, that the dip wherever observable was between N. and E.

176. This schist continues in the descent to Kalsee, and under such protean aspects, as renders the study of its relations extremely interesting. It is at one time a green slate, with smooth laminae, which by a gradual change, passes into a rock, that in hand specimens could not be distinguished from a greenstone. The transitions into this rock are remarkable for affecting a rhombohedral cleavage. Within a few yards it again appears as a shattered slate, consisting of very thin and scarcely,

adhering plates confusedly united, as if they had been crushed, or at least suffered some violent pressure. The ordinary type is seen to pass into a veined one, the veins being quartz, and this gradually into a quartz rock of a dark colour, highly charged with the indurated clay of the slate, and still intersected, as that was, by veins of pure quartz. The laminae of the most perfect slaty varieties are very often bent; small patches of limestone, evidently the traces of included beds, occur along the whole line.

177. At Kulsee, the rock is still argillaceous schist of a very perfect type, dipping E. of N., that is, at the bungalow belonging to Major Young on the hill; but in the descent to, and in the town, the rock in situ is concealed, and it is not till after having passed it a mile or so, that a new formation (sandstone) is observed to be established. The strata dip S., and a little further on, are vertical. From this position they gradually passes to a dip E. of N., but possess still a high inclination. The character of the rock is perfect, and leaves no doubt that the argillaceous schist has here terminated, and is succeeded by a totally different formation. I shall therefore defer my details of the new rock till I follow out all the details of the former one, and trace it in a similar manner to its boundary in every other quarter in which it has been examined.

178. I shall take up my description at the point below the village of Kande in the Bural district, where the last patch of gneiss was found, (Art. 139). It was noticed that the ridges above appeared, by their outline and arrangement, to be limestone; a few traces may also be seen in the bed of the stream, and fragments of the local conglomerate which always accompanies limestone. The rock then becomes a talco-argillaceous schist, being frequently distinguished for its beautiful pearly lustre and pleasing colours. This type is further remarkable for its smooth gently curved laminae, and the minute undulations or furrows of their surface. These latter I have almost invariably observed in slate that contains a sensible proportion of magnesia. Besides this well marked variety, there occurs another of an earthy character, which gradually passes into hornblendic schist.

180. The dip of the strata in this glen, (Bural,) was uniformly W. and N. W., and therefore not conformably to what I suppose the general dip of the formations throughout these mountains. Nor is it as



irregularity confined to a small extent of country, for the surrounding ridges and peaks are all obviously conformable in dip to that observed in the valley itself. In the Rama Sera glen again, it was observed to be,\* which is something more approaching to the usual dip. In this case the principal effect due to the disturbance of the strata, (if they really be disturbed,) would be found in the Bural glen. It is to be observed, that both the Bural and Comoulda rivers spring from the furrows which intersect the sides of the great Kedarkanta peak elevated — ? feet. This peak is remarkable for its shape, and for the arrangement observable on the summit. The shape is that of an immense truncated cone, which appears to have an oblique position, owing to its greater slope on one side, and precipice on the other; the summit is flat and of some extent; at one end is a considerable hollow, in which are wedged together, in utter confusion, enormous blocks of gneiss, the rock of which the mountain consists. The strata appear to dip N. W. What connection the peculiar character of this peak (if any) may have with the irregularity of the dip, it would be vain to enquire without a more detailed examination of the vicinity.

181. At the mouth of the Bural glen is an extensive flat, communicating with a similar one in the valley of the Jumna, and very little higher than the present level of the latter. It is observed to terminate in the bed of the Jumna in smooth rounded elevations, which on the river side are cut down vertically, and exhibit, in the precipice facing the river, their structure in the most complete manner. This precipice is about 120 feet high, and is composed of loose gravel and sand, with numerous round stones of every size sticking in it, some of them half projecting. On the opposite side of the river appears a similiar bank, composed of similiar appearances, and of the same height. The intermediate space, to judge by local appearances, must have been once filled up; for so narrow is the gorge, that no possible slope at which they could lie would clear them of the river bed. Indeed, the one is washed by the waters of it, and at the foot of the other, the path is not more than a few feet wide.

182. The right bank sinks, as I have said, gradually into the broad and level flat at the mouth of the Bural glen, the slope being, like the latter, covered with verdure. The left bank continues of moderate

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width to a point below the affluence of the Bural, and then gradually subsides about half a mile. Below this point occurs a third similar flat, doubtless composed of the same materials, and containing about half a square mile of level ground. It is worthy of remark, that the three are, as nearly as the eye can judge, of the same level. It should also be noted, that in the two, the structure of which appear, nothing like strata or a division, nor distinction of deposits occurs; the great and small boulders are indiscriminately mixed in every part, and the whole has the appearance of being the effect of some very powerful, but sudden or short-lived cause. The fragments most abounding are quartz rock of all colours, next to this is hornblende schist, with very few of granite or gneiss.

183. The last rock observed in the Bural glen was a blue talco-argillaceous schist, with a pearly lustre. In the bed of the Jumna, close by the suspension bridge, a mass of limestone occurs. On crossing the river, a rock of limited extent is met with, and of very anomalous character. It is probably a mixture of chlorite quartz and felspar, the latter not abundant, or the green ingredient may be some variety of hornblende. The structure appears to be laminar, yet the fracture is such as to indicate the amorphous. It is a tough rock, and breaks with sharp corners. It is succeeded by extensive strata of a talco-argillaceous schist, the prevailing colour of which is an olive brown. The dip appears to be N. W. the same as that in the Bural glen.

184. From Burket to Bimsa, the prevailing rock is chloritic schist, often inclining to argillaceous, often soft and decomposing, intermixed with beds of quartz rock which generally incline to a green colour. The earthy, or decomposing and the more perfect straight laminar types, are often found in the compass of a few feet, nor can there be any doubt of the unity of this formation when we view it in nature; although a collection of the specimens, unless extremely numerous, might exhibit some very striking contrast. Frequently, the laminae are extremely thin, quite flaky, and in this case they are seldom separable of any size. From such a rock, it is impossible to detach a specimen, for on the application of the hammer it flies into showers. When the colour inclines to green this rock is generally soft, when to blue it is hard. No good examples of strata are met with on this line, the rock seldom appearing but in surface patches of no great extent.

185. From Bimsa the road ascends a lateral ridge, and thence descending upon the village of Tevan, crosses the Bunnee glen near Kateel. On the summit of the ridge, or rather just below it, there is an exposure of the rock, (in a space little exceeding ten square yards,) of the following very dissimilar substances :— 1. a light bluish grey mixture of talco-argillaceous schist and quartz, this changes to, 2. a more perfect schist, with bent laminæ, the colour still bluish or grey, the aspect a little talcose ; 3. a true chloritic schist, with similar bent laminæ ; 4. a dull green earthy compound without lustre, has a subconchoidal and uneven fracture, splits into thick flags, and is subcleaveable ; it is probably a mixture of hornblende and felspar, or of chlorite and felspar, or possibly all three ; 5. a light bluish green talcose schist, with curved and straight laminæ and considerable lustre. These types will also serve for a description of the rock as far as the ford over the river, occurring in various propositions and successions, which it would be a waste of time to attempt to devolve, the whole being united in the clearest manner, and constituting but one formation.

186. The ridge just crossed in its prolongation, puts on the appearance of the limestone precipice described, Art. 181, and on crossing the Bunnee river, there is little doubt but that these appearances are indicative of a limestone bed. It continues for about two miles, when argillaceous schist establishes itself, extending over the Gooddur Kuttal Pass to Moolla, a small village in the Gooddur glen. This schist is certainly not at all talcose in its aspect. It is of a fine granular or earthy composition, is very soft, and is remarkable for splitting into prisms, not laminæ or slates. They are sometimes of considerable length, slightly flexible, and would form very excellent slate pencils. It is of a great variety of colours, black, bluish, greenish, yellowish, olive brown, reddish, &c. &c. It contains numerous beds and veins of quartz. Below the village of Moolla, it passes into, or is replaced by a true chlorite, dipping N. W. with an inclination of 35°.

187. From Moolla to Horinsee, the argillaceous schist prevails, none of a chloritic character being visible. Close by the latter village, there is a mass of rock deserving of examination. It appears to be in one spot of a fine blackish greywacke schist, with scales of mica disseminated ; the composition fine granular, the structure well marked schistose. It is in contact with, and passes into a reddish brown rock of

coarser composition, with a structure amorphous, or at least only subschistose. Adjoining the latter, a greenish grey rock of fine granular composition, the structure entirely amorphous, and having a high specific gravity; consequently containing either hornblende or augite. The three types are all included in a single mass of no great extent, and on passing them, argillaceous schist of the usual character is found.

188. From Horensee, the route passes down the Bhudree glen, which is of some width, and encloses a good deal of level ground. In consequence, the rock is not often visible. Close to the village of Kol, there is a sudden descent, in which strata of schist appear intermediate in character between argillaceous and micaceous schist. It is accompanied by quartz rock, which as usual, forms a series of transitions into the schist. A little beyond Koree, a pale bluish grey subschistose rock, a composition probably of indurated clay and quartz rock, comes to the surface. It is succeeded by a dark blue argillaceous schist, containing nodules of quartz, the laminæ of the slate being bent round them; a bluish grey rock of a subschistose structure, not very quartzose, becomes then established. If it were not that it wants the decided appearance of a mechanical origin, I should feel strongly inclined to call this a greywacke. But the erroneous application of the latter name is the more to be guarded against, since it has become certain, that some of the rocks which have been distinguished by this appellation, are identical with the red sandstone, a rock of which no trace is found in this quarter. Under the title of argillaceous schist and quartz rock; it cannot lead to any false conclusions, and as such, it may be described until our nomenclature of rocks be more discriminative of them than it is likely for a long time to be.

189. It continues as far as Koodæon in the valley of the Aglar, forming the whole of the ridge which separates the Bhudree glen. In the bed of the Aglar, a very similar rock prevails, but on the ascent it acquires the more characteristic aspect of a true clay slate. In faceous conglomerate is also seen in isolated masses, and occasionally a blue limestone. Near the village of Ramon, the latter rock becomes established, to the exclusion of the slate. It is, however, of very various aspects, sometimes it is a black, hard, non-effervescent rock, foetid when struck, and possessing scarcely any resemblance to limestone. This is its condition generally in the vicinity of the masses of gypsum which are here found; at other times it is highly siliceous, and though bearing

the appearance of limestone, might from its non-effervescence, be called schist; the pure blue limestone is, however, also found, and in considerable quantity.

190. The gypsum which is associated with this limestone, is of a saccharoidal aspect, the colour being beautifully white, and the grain fine. No crystals, except the most minute, have been observed. It is found neither in beds or veins, but in superficial amorphous patches, presenting an appearance of considerable singularity and interest. It is always connected with the black non-effervescent rock described in the preceding paragraph. The latter has very often the appearance of reunited fragments, and the gypsum sometimes contains nodules of it. Without doubt some connection exists between the origin, or at least the present place, of this gypsum and this very singular rock, always found in contact with the former, and not observed hitherto anywhere but in the immediate vicinity of it. There is not the slightest appearance of stratification in either rock.

191. From Ranon to the summit of the ridge, (Mussooree Tuba,) limestone prevails, and the varied and picturesque disposition of this mountain sufficiently attests the character of the rock. In all countries it has been observed, that not only are the limestone districts most fertile and productive under the labours of agriculture, but that also when abandoned to the hand of nature, they furnish the most picturesque and beautiful scenery. The summit is composed of the same rock, and constitutes one of the most romantic spots within the circuit of the mountains.

192. Advantage has been taken of the elevation, and the consequent coolness of the climate, to establish a nursery garden at Saharunpore. This is intended for the purpose of naturalising the more hardy plants of the interior, that otherwise would languish and die, under the fervors of a tropical sun if too suddenly transplanted. It promises to be eminently successful, though as it had only been just begun when I visited it, this opinion must rest on other grounds than experience; no doubt a favorable feature in the plan, though accidental, and not a disposing reason for the original choice, is the nature of the rock; the argillaceous and micaceous schists, the only rocks besides limestone from which the selection lay, furnishing a very poor and meagre soil for almost every description of produce.

193. From the garden, the road descends obliquely along the face of the range to the village of Juree Panee, in this line the limestone is lost almost immediately, and argillaceous schists succeed. They are of various colours, many of them very bright, red, yellow, green, grey, olive brown, purple, &c. This change of colour is characteristic of this rock, which is further remarkable for its different degrees of consistence, being at one time soft and diffusible in water like clay, at others hard, and though not furnishing good roofing slate, yet very similar in mineralogical character to that substance.

194. At Juree Panee, limestone again appears, but in small quantity; some specimens were observed of it containing veins of fibrous gypsum. These were of the most regular type, and had no resemblance to the black scoriaceous rock before noticed, as associated with the gypsum near Ranon. The argillaceous schist again establishes itself, and continues to Rajpoor at the foot of the descent. In this line it is rather harder, in general, than that above described, and inclines more to blue, purple, and green colours. It contains masses of quartz rock often strongly impregnated with the matter of the slate. At the foot of the descent, the structure appears to change to that already described Art. 184, as consisting of thin foliæ or leaves scarcely adhering, and of very limited size.

195. The mountains which bound the Doon to the north, and which stretch from the Jumna to the Ganges, are all composed of argillaceous schist. Beds of limestone occur similar to those already described, but never of any great extent. Gypsum also similar to that at Ranon is found, and under similar relations at two other places, and it is probable, will be eventually discovered at many more. In the bed of the stream in which the Sunsar Dhora, or Dripping Cave, is situated, and about a mile higher up, may be seen the remains of a very large bed of this substance, the greater part having been removed by quarrying. It lies in the same kind of superficial amorphous mass, and is associated with the same foetid anomalous black rock as at Ranon. There are two varieties which lie in contact, and between which, a kind of transition takes place. The one is of a beautiful saccharoidal aspect, of a snowy white colour and fine granular composition. The other is of a dirty white colour, approaching to yellowish grey, and the composition is finer, almost impalpable; nor are the minute crystals discoverable in

it, which may be seen to constitute the grain of the other, being in fact dull and earthy, like chalk. It is the more abundant of the two, and indeed may be had in almost any quantity. It would probably answer for the preparation of plaster of Paris, though certainly not for statuary.

196. The other locality is in the bed of a small nullah, which falls into that in which the Dripping Cave is situated. There are some springs in the bed of this stream, which have a strong odour of sulphuretted hydrogen, and I should notice that the water of almost all these streams deposits carbonate of lime. The gypsum at this locality was described to me as forming a mass incumbent on clay slate, and not in contact with either limestone or the black rock so often mentioned. This mass had a flattened form, and might be called a bed; a perpendicular fissure in the slate was filled with gypsum continuous with the upper mass, thus giving the idea of a deposit. In my attempts to find the place I was not successful, but I met with many loose masses, and some of rather impure appearance, entangled with the angular debris which had rotted from above, and settled into banks of different heights at the foot of the mountains. It was associated in such a manner, as to leave no doubt that it had been in a state of fluidity when it assumed its place there, and thus we might pronounce with some certainty on the comparative ages of these masses of gypsum, which in this instance at least must have been posterior to the formation of this local debris.

197. We have now again descended to the Doon, where a totally different order of things prevails. It may be useful before proceeding to the Eastward, to notice different detached points at which the same formation of argillaceous schist has been observed. At Riki Khes and along the banks of the Ganges, as far as Deoprag, no other rock is seen. In the route too from Dehra to Teeree, the residence of the Gurhwal Raja, it equally prevails, the several types corresponding accurately to those already described. In particular may be seen the soft variety of various bright colours in the ascent from the village of Manjgaon in Sikimana pergunnah. Excellent roofing slate is general throughout this quarter, nor are the houses ever covered with any other materials; along the whole valley of the Aglar, it was equally general, occasionally presenting however a patch of limestone. The Byrath range, which

shuts in the Umloo, is also composed of it, frequently containing beds of quartz rock. In the valley of the Tonse, argillaceous schist is traced as high as the village of Kande. In the route from Calree to Jytull, little other rock is seen excepting limestone, which in the neighbourhood of Kangra is abundant.

198. From Jytull again to Subhattoo, the road, passing along the summit of a ridge, carries with it, the whole way, argillaceous schist. In this tract, no limestone beds are found, but quartz rock is common from Subhattoo to Bar; in descending to the plains the same rock continues. In passing to the north road to Kotguruh, it is equally constant, at least as far as Lunla; how much further it continues in that direction, or where the junction with the mica slate takes place, I have no means of judging. From Subhattoo to Joonug, the residence of the Ranee of Kyoontal, it is equally constant, and extends probably much further. In the route from Nahun to the Choor mountain, clay slate prevails to within a very short distance of the latter, containing extensive beds of limestone, which in detached masses stretch along the crest of the Sacen range, dividing the valley of the Girree from that of the Jullal; connected with their beds are probably the masses which form the summits of the Rajguruh and Krol mountains; at the feet of these the schist reappears, continuing to extend as far as Subhattoo. Finally, the valley of the Sutlej between Koomharsen (or a little below it) and Soonee contains this formation.

199. It is time now to return to our details on the Kedarnath road, which were broken off at Almorah, (Art. 152.) At that place we have seen micaceous schist is the rock. But the details of it I shall postpone for the present, to trace out the limits and relations of the argillaceous schist in descending to the plains. There are two routes in which these have been examined, the Pass by Chilkeea, and that by Bhumoorree. In the first of these, micaceous schist extends a few miles south of Turkhet, the second stage in the route from Hawal Bagh to Chilkeea. Between Turkhet and Pepul Point, it is gradually exchanged for an argillaceous schist of peculiar character. It is occasionally quite soft, white, and talcose, being rather meagre than unctuous. The micaceous schist again makes its appearance after a short interval, and then a very fine-grained gneiss in the ascent to the Bukar Mundal Pass. on the summit of which is a dirty brown-coloured micaceous schist



of an arenaceous composition, which is succeeded by a magnesian clay slate accompanied by quartz rock. The former frequently contains patches of a soft white clay, which evidently originates in a decomposing talcose schist, as the latter occurs in contact with it.

200. The quartz rock is most abundant as we approach Peepul Point, and immediately above the place of encampment there occurs a set of appearances which I think deserve description. It is so seldom in these mountains, that we can trace the junction of two rocks, that no opportunity should be lost where it is accessible of recording the phenomena. Fig — will render the following description more intelligible; it is anomorphous rock, apparently one of the numerous types of argillaceous quartz rock. It is seamed in every direction, as this rock very often is, but exhibits no trace of stratification. C. which adjoins it, is perfectly distinct, the line of junction being strongly marked. It is a white arenaceous rock covered with brown spots, crumbly, and with little consistence, but feeling gritty in the mouth. It is probably quartz, or a mixture of quartz and felspar, and the iron-stained spots may arise from decomposing pyrites. It passes below into a tolerably hard rock. D. is a series of thin foliæ or leaves (they can hardly be called slates) of argillaceous schist, of a plumbaginous aspect; they are soft, and soil paper. The series in its progress upwards gradually diminishes in thickness till it disappears; it is a quartzose argillaceous schist, stratified distinctly, the strata lying parallel to the preceding, nearly vertical. This latter, like A, are types of the ordinary rock, which seems to oscillate just here, between quartz rock and argillaceous schist.

201. The character of the rock C. (I can hardly call it a vein,) affords strong promise of the existence of graphite in this quarter. This mineral belongs to formations of the earliest æra, as anthracite has been referred to the suppositious transition class, and coal to the æra of secondary rocks. It is remarkable too, that the deposit from which graphite of the best quality is procurable, and which indeed furnished nearly the whole civilized world with the variety used for pencils, that of Borrodale in Cumberland is situated in a clay slate on the border of primary mountains. There does, it is true, appear some doubts as to the real nature of this formation, for some insist that it comprises rocks of the trappean type; however this may be, it is not the less certain that argillaceous schist is known often to contain very valuable beds or veins of graphite.

202. From Peepul Point to Okuldoona, the route is in the bed of the Casilla river, the latter being crossed eleven times; every where it is full of the rounded stones so often noticed, and their accumulations are sometimes observed to attain a height of 150 feet even, above it. It may be stated, generally, that where the river bed, or valley is narrow, there they attain to the greatest height; and where sufficiently wide, the extent is greater, but their height less. What the depths of those accumulations in the immediate bed of the river are, I have no data to determine accurately, but there are several reasons for believing it to be very great. They seem to be all of a very uniform character, modifications of quartz rock, more or less impregnated with clay slate.

203. The rock in situ here is of a rather singular character, but it will be here afterwards seen, that it is found in many distant parts of these mountains. It is in fact a quartz rock, but contains talc instead of mica. The strata are very obscure, although it is traversed by numerous irregular seams. In one instance I observed a mass of clay slate of a lenticular shape, inclosed in it, the length of this included nodule was about 10 feet, the thickness one foot; something like transition was observed at the junction. This rock has a considerable extent in the stage to Ookul Doonga. It is succeeded by a black amorphous rock of almost impalpable composition, which is traversed by veins of quartz. This passes into a talco-argillaceous schist with thin laminæ, but so tender, that no specimens are obtainable. Quartz rock of an ordinary character next succeeds; the strata very irregular and contorted. It is of a reddish colour, and almost compact, and in mineralogical aspect strongly resembles the boulder stones found at the foot of the hills. Fragments of the talcose quartz rock which I have just noticed, and which is not seen in situ in the intermediate space, have been observed at Dhikoollee, a distance of at least 18 miles. This rock is so remarkable, as already noticed, that its fragments are recognised with the greatest certainty, and we are thus enabled to trace the course which these boulder stones took, as also to judge of the distance they were transported.

204. Ookul Doonga is situated on rather an extensive flat; the bed of the river is composed, as already noticed of these rounded, stones. The rock is not therefore visible for a distance of a mile and a half; it is then seen in the river bed, and has the character of a micaceous fine-grained sandstone, stratified distinctly, but not at all schistose, or at

least not readily fissile. The fracture is difficult to obtain, as it splits in various directions with a kind of cleavage, on the face of which it is difficult to discern the mineralogical structure; the strata are frequently curved, and the dip sometimes reversed. On it lies a rather thick bed of a rock of an argillaceous character, rather one of the shales than a schist. It is loose and unconsolidated, having the appearance of a soft and tender rock which had been crushed; nothing like marks of stratification are observable. Its colours are various, and with this shattered appearance, characteristic; i. e. green, white, black, purple, red, yellow, all of decided tone, and changing often within a limited space. On this lies the diluvian deposit of rounded stones and gravel, which notwithstanding all the inequalities of the ground, and they are great and numerous, has its upper surface perfectly even and almost level. It is to be remarked, that wherever these beds are visible in their lowest limit, they are always found resting on these shattered masses of shale, and never in any instance on the sandstone.

205. In this rock we take leave of the argillaceous strata which we have now to follow out in the route leading from Almorah to Bhumouree. The micaceous schist beds, the details of which, as before observed, we will postpone till we come to the description of the granite, continue beyond Powree, the first stage, to within a short distance of the halting place, Ramgur, on the summit of the Sohakatee Pass. It is exchanged for a very hard bluish grey rock, with much of the external aspect of limestone, but non-effervescent, or very rarely so, and in a low degree. It is marked with stripes of a darker colour, breaks with a sub-conchoidal fracture, the grain of which shews it to be a composed rock, but so small is it, that there is difficulty in determining precisely what are the ingredients. Mica and quartz are evident, and a dark mineral, which may be either indurated clay or hornblende; some specimens contain also carbonate of lime. It forms a lengthened mass in the micaceous schist, being observed to descend to the bed of the Ramgur, and rise on the opposite side, holding an oblique course across the valley for a considerable distance, which is easily traced, owing to the peculiar surface character of the rock. From all the characters of the mass I am very much inclined to consider it as a vein.

206. Below the Pass, we have a white schistose quartz rock of rather arenaceous composition. It may contain a small quantity of felspar.

In the bed of the Ramgur, the rock is of a light grey colour, with black specks disseminated. This rock evidently contains talc, (prismatic talc mica,) as well as quartz, and perhaps some felspar. Near the Bungalow, the character becomes more regularly that of gneiss, and at the foot of the ascent to the Ghagur, specimens are obtained which however, unlike the Himalaya gneiss, are yet equally entitled to the name, at least in the present state of our terminology. This gneiss which constitutes the whole of this range, at least in this quarter, is deserving of a detailed description.

207. This rock may be said to be characterised: 1. by its small proportion of felspar; 2. by the predominance of a talcose or argillaceous ingredient; 3. by the singular types under which it sometimes appears, or in other words, its transitions into very anomalous rocks. It is of a schistose rather than a slaty structure; has a talcose aspect, varying in colour from a greenish to a yellowish grey, soft though tough, and of the peculiar composition which entitles it to be called gneiss, though of so small a grain as to occasion the separate ingredients to be not always easily recognisable. Besides the felspar and talc, it contains quartz, and occasionally hornblende, (Hemi prismatic augite spar.) The two most singular types into which it passes are; 1, a white schistose rock, probably composed of talc quartz and felspar, and 2, a dull reddish brown amorphous rock of earthy composition, and of a cleavable structure. This passes into a harder type of a darker colour, which is equally remarkable for its cleavable structure, and want of the schistose. This latter is found on the summit of the Ghagur, and has all the appearance of a perfect greenstone.

208. Below the summit on the south side, the same talcose and schistose gneiss is again found as in the ascent from the north; but in the descent to Bheem Tal, it appears to pass into an argillaceous schist, which occasionally seems to oscillate towards hornblende rock. In the latter case, instead of being schistose, it is always cleavable, the joints of the cleavage being of a copper brown colour, and exhibiting no marks of the internal composition, which can only be observed in the cross fracture so difficult to obtain in this rock. At the Pass near Sumket, which may be considered as the foot of the Ghagur, a rock occurs very much resembling some greywackes. It is a granular mixture of quartz and clay slate. At Bheemtal, the cleavable rock is prevalent.

209. The strata of which the Ghagur is composed, dip very regularly, at some points varying between E. and N., the inclination generally small, though sometimes as high as  $40^{\circ}$ . The cleavable types are, if at all, very indistinctly stratified, but they are traversed by rents or cleavages in every direction. The two types may be seen everywhere passing into each other, nor can there be a doubt of their geological identity; yet it is impossible to have specimens of greater dissimilarity in mineralogical aspect than are furnished by these rocks, a proof, if it were wanting, of the mischief of adopting the geological relations of rocks as the basis of our classification.

210. Between Bheem Tal and Bhumouree, some interesting phenomena are to be observed. The rock continues to be in its general character an argillaceous schist; some specimens of a purple colour and very perfect type being procured a little below the former place. In the vicinity of this is seen a small amorphous mass of a tufaceous character, and dark greenish grey colour; and at no great distance again, a huge block of the most compact quartzose conglomerate. In this latter, the cement is of a hardness and compactness which rivals the imbedded portions. No other sample of this rock is seen, the mass is evidently not in situ, but there are no circumstances in the vicinity to give any clue to its origin.

211. In the bed of the Nullah, half way down, round blocks are seen of a greenstone, in which the crystals of hornblende, (Hemi prismatic augite spar,) are distinct. The specific gravity of this rock is 2.9. That of the purple slate is 2.58. The latter passes into a dark blackish rock of a fine grain, and less perfect schistose character, the specific gravity of which is 2.7. The determination of these evidently points it out as a transition between the greenstone and slate. Fragments of toadstone are found in the same neighbourhood, having the same, specific gravity of 2.7. These consist of a dark, greenish grey ground, with white oblong spots, occasioned probably by imbedded crystals of felspar. The base evidently contains hornblende or augite, but the composition is impalpable, and to appearance, even with a magnifier, homogenous.

212. A little below this a rock is found something resembling the transition between the greenstone and the schist, but of a lighter colour, it may probably be called a fine greywacke. It is distinctly

stratified, dipping  $10^{\circ}$  N. W., the angle of inclination being  $44^{\circ}$ . It gradually passes into a most perfect micaceous sandstone, which is found occasionally to contain small nodules of greenish grey clay. The transition is observed to a great advantage, as the whole of the strata are exposed, nor have I seen in any part of the mountains an appearance that more interested me.

213. A little below this, we descend to the Ballea Nuddie, where the sandstone is again found, and resting on it various coloured and shattered rocks, described in Art. 204. In the bed of the Nullah, the fragments are, some limestone, some clay slate of a hardness approaching to that of jasper, but the greater part quartz, more or less impure. Near the bridge may be seen blocks of the blackish amorphous rock before noticed, and which in one solitary instance has been observed to have a partially cavernous structure; some of the cavities being filled with a zeolitic mineral, (Kouphone spar.) This rock certainly appears to pass into the purple argillaceous schist, but as so often remarked, access is wanting to the junction of the rocks in order to establish this fact with certainty.

214. In this vicinity, (a little below the Buleea Nuddie,) I picked up fragments of a perfect greenstone of a large grain, very similar in fact to that of a granite. The ingredients were compact felspar and quartz. I have never found any thing like this rock anywhere else, nor have I been able to trace it to its original site. Sandstone, irregularly mixed with conglomerate, then continues to Bhumouree, where also it is to be seen, (in the bed of the Nullah,) dipping to the North at an angle of about  $25^{\circ}$ . Bhumouree is situated at the foot of the hills, in the Bhabur or elevated part of the Terrace.

215. I must now return to a route, the details of which ought to have been given before the last two, but the omission is not one of any

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of the gneiss to very near the summit of the ——— Pass, below which it is replaced by chloritic schist: fragments of hornblendic schist being also very common. The former continues to near Pokree, occasionally giving place to talcose schist, occasionally to talcose quartz rock. Near some of the old galleries of the copper mines worked here, are beautiful specimens of an emerald green straight laminar slate with high

\* MSS. defective.

lustre. It passes so gradually into talcose schist of the palest colour, as to leave no doubt of their being but coloured modifications of the same rock. In the rock in which the galleries at present worked are situated, a flesh coloured schist is found, of a mixture of talc and quartz. It passes into a subschistose rock of a similar composition, the latter ingredient being in greatest quantity; in fact a talcose quartz rock. This is exchanged a little lower for a dark olive green soft rock, of a schistose structure, but not laminar, the aspect of the fracture being scaly. I think it consists chiefly of hornblende.

216. The copper mines here are situated in the quartz or talc slate just described, a rock of so soft and tender a nature, as to form a very strong objection to the efficient working of them by its frequent failures in the different galleries. At the time I visited the place, they had all fallen in, and consequently no specimens of the ore were obtainable, except such as could be gleaned from the rubbish lying at the mouths of the several galleries. These pointed to vitreous copper, or the sulphuret, the richest ore known. Copper pyrites was also observed, and blue and green copper in small quantity; whether the ore is in the form of veins or beds, it is impossible to judge in the present state of things. The water which issues from the galleries has a specific gravity of ———, is impregnated with the sulphate, and deposits sulphate of copper on the stones over which it flows. These mines evidently have been very productive, to judge by the extent to which they have been worked.

217. On the ridge from which the descent to Boomot commences, micaceous, or perhaps rather an impure talcose schist occurs. It contains a good deal of quartz, below this a decided talcose schist appears, of a greenish hue. In the bed of the torrent, at the foot of the ridge, blocks are found of hornblende rock, containing pure hornblende in bundles of needles, and glassy actynolite, in contact with a reddish felspar. I did not, however, succeed in detaching any good specimens; some rolled pieces of hornblende were found, having the closest resemblance to charcoal, in all save specific gravity. In these, the apparent fibre was most commonly curved, the lustre always dull. The rock from hence to Boomot is entirely talcose, being either a granular mixture of talc and quartz, (talcose quartz rock,) which occasionally becomes quite soft, and disintegrating; oc-

asionally a perfect talcose schist, which oscillates, as the rock always does, towards chloritic schist. A granitic mixture of hornblende and quartz is also found in limited quantity, the type in fact of a greenstone.

218. At Boomot, which is situated on an extensive flat, we find the rounded stones so often described, the flat being entirely composed of them; the height above the river is 200 feet, and the extent considerable. The rock in situ is seen, however, at the third of the ascent, and it is chloritic schist, which appears on the other side to pass into greenstone slate. On the left bank a larger flat is seen, being upwards of two miles long, and half a mile, or more, wide in the broadest part. This is also composed of the same rounded stones; these beds can never have owed their origin to any body of water so limited in quantity as the present supplies of this river; and besides these table lands are in reality 200 feet above the present bed. There occurs here an appearance which is of considerable interest; there are two levels, and a considerable difference between them in height, the lower table being nearest to the river. This condition of things certainly reminds one of parallel roads, as they have been called, in some of the glens in Scotland. Similar appearances have been observed by Captain Hall in Chili. The resemblance is the more interesting, because I believe it is now a generally received opinion, that the latter owe their origin to the successive burstings of a lake, at distant intervals of time.

219. On crossing the suspension bridge, a rock very like greenstone slate is found, it passes into the chloritic schist observed below Boomot, and through that, on this side, into a perfect talcose schist, of white, yellow, and blue colours, &c. On the flat no rock is visible, but again in the bed of the stream, which comes down from Dhunpore, the granite rock, which I have called greenstone, is again detected, occasionally passing into a greenstone slate. It contains nests of indurated talc or potstone. The schists are always conformably stratified, that is, they dip to N. E., but the greenstone is generally amorphous. The schistose rocks continue, often verging on chloritic schist, and interstratified with quartz rock as far as the route lies in the bed of the Nullah, which is of great depth and narrowness, the sides of mural steepness laying open, in beautiful natural sections, all the particulars of the rock worthy of notice.



220. It was observed, that sometimes the change from the green schist to the quartz rock was sudden; sometimes a real transition is seen. In general, the schist has a stronger resemblance to the chloritic types, though it is also found a perfect hornblende schist. The dip and inclination of the strata present great local irregularities, the former being sometimes reversed within a few hundred yards, and the latter not unfrequently  $90^{\circ}$ . The direction appears to follow a curved line, being in the first instance observed as conformable, *i. e.* N. W. It is then seen to run N., from which point it gradually changes to N.  $35^{\circ}$  E. In the first case the dip was as usual N. E.; as the direction changes, the strata become wedge-shaped, and assume a vertical position, till at length it is found that the dip is reversed, being finally S. E.

221. From the bed of the Nullah, the route ascends to Dhunpore, where are worked the most valuable and productive copper mines in the mountains. The rocks which are found in the ascent to the Koangola Pass and descent thence are various in character, and a more enlarged examination of this neighbourhood is required to determine their true relations to each other. In the ascent to Dhunpore, quartz rock is the prevailing substance, which passes on the summit of the ridge into a very thin slaty rock of a yellowish colour, exceedingly hard, and composed apparently of quartz with some talc. The laminae of this are not above a tenth of an inch in thickness. They separate with greatest clearness, are often bent or curved, are rather brittle, and consequently not obtainable of any size. This type might be called slaty quartz rock, in contra-distinction to schistose quartz rock. It passes into the pure amorphous type; argillaceous schist, then succeeds, variously intermixed with limestone more or less pure. The former occurs here of an intense black colour, similar to that of basanite. It has a schistose structure, but never separates into thin slates, the attempt to obtain such generally producing a conchoidal surface, or at least one more or less uneven. It is moderately hard, of a fine grain, receives a good polish, would form a most superior description of writing slate, and is not even inapplicable to the purposes to which basanite is applied. It has a cleavage, or set of natural joints, the surfaces of which present the appearance of a slight iridescence, or pavonine tarnish. This cleavage is most commonly, or at least very often, transverse to the direction of the schistose

structure. It is in contact on two sides, with an argillaceous or siliceous limestone, which in its immediate neighbourhood passes into a perfect rotten stone. What the nature or cause of this caries is, which so often appears to attack rocks of the greatest solidity, no one has yet explained in a satisfactory manner. The unchanged rock is of blue colour, impalpable in composition, with a conchoidal fracture, and in appearance resembling perfectly the most regular limestone. It is, however, a very impure one, being highly charged with argillaceous or siliceous ingredients, or perhaps with both, occasionally it even strikes fire with steel, and approaches the nature of schist. In its passage into the rotten stone it is observed, first to change a little in colour, becoming gradually more tinged with the peculiar mud colour of the latter, which is so far different from the rotten stone of Derbyshire, as to be of a more yellowish than a brownish tinge. The grain is observed gradually to make its appearance, and the rock to be full of joints or cleavages, till at last it is found of a dirty yellow colour, fine grain, very friable, and with a specific gravity of only 0.9. A series of specimens connecting the two extremes has been collected, which shews the progress of the change with great clearness; a rotten stone of bright colour appears to originate in a real argillaceous schist.

222. The rock in the neighbourhood of Dhunpore is, as I have already stated, a quartz rock, it is distinguished for its peculiar shattered and fissured aspect, no trace of stratification being observable except on the great scale. The irregularity of the strata is great, and the change of dip frequent. A mass of red dolomite appears in the middle of it east of the village, and it is in this latter rock that the copper mines are situated. This dolomite is evidently connected with the siliceous limestone on the Dhobree side, in which also a mine is worked, but the produce is inconsiderable. This mine is remarkable, however, for furnishing lumps of limestone, apparently changed by a similar process to that which produced the rotten stone, the result in this case being a perfect chalk; such a change in the surface of limestone fragments is common, and has been noticed in the preceding details; but excepting at Dhobree, I have never met such large pieces so perfectly changed to chalk. These fragments are used as a flux in the reduction of the copper ores.

223. On the Telkhunnee Pass, a brown schist is found, and thence descending to the village of Bissona, various modifications of the same passing occasionally into argillaceous quartz rock. Near the village, a granular rock is seen composed of quartz and indurated clay, having much the aspect of a greywacke. Here a mass of reddish limestone is found imbedded in the slate, in extent about 50 yards by 10, and capable of furnishing a very beautiful marble. Schistose rocks continue to Kirsal, where traces of limestone occur in local conglomerates, in tufaceous masses, and even as an ingredient in the more compound schists. The prevailing type approached to that of stone slate, being of a composition almost impalpable, moderately hard, and of colours varying from greenish grey through yellowish grey, to reddish and purpleish grey. These specimens are seldom of a perfect slaty structure, the cross fracture is easily obtained, and it is often conchoidal. Below Kirsal, these schists assume more of a chloritic or talcose character, and become more decidedly compound at the foot of the descent. Argillaceous schist is established of a very regular type, though it is found intermixed with the green schists also, which are of a chloritic character.

224. There is another route tending from the Boomot suspension bridge to this point in which the rocks have been examined, and it will be more in place to record the particulars here. This route ascends by the village of Acend, in which the talcose schist observed in the vicinity of the bridge is exchanged for quartz rock, containing, it would appear, nests of indurated talc. At the village, a decided chloritic schist is found. The dip in all the schistose rocks is conformable, but in the quartzose or granular types, the strata are obscure. Between Acend and Jak the same rocks continue with an occasional appearance of brown tender micaceous schist. From Jak to Bendoolee, the transition into the latter is more frequently observable, and it also assumes an argillaceous character. The granitic rock which I have for distinction sake termed greenstone also occurs, forming as usual a transition into the green schist.

225. From the village, the route descends to the bed of the Bendoolee Nullah, the rock being still chloritic schist, verging on argillaceous, and enclosing huge masses of quartz rock, the relations of which to the schist appear very interesting, and deserving of further development. From what I could observe, it struck me, that these masses were

very large veins, their breadth being inconsiderable compared with their length, and their course oblique to the direction as well as to the planes of the strata; nothing like the marks of stratification can be seen in them, but they are traversed by seams in every direction, very similar in this respect to the smaller and less equivocal examples of quartz veins. One of these masses is observed to descend the mountain side into the bed of the stream and ascend the opposite side, always keeping the same direction, limited in breadth, and easily traceable by the eye for many miles.

226. In ascending the bed of the stream which descends from the villages of Ketee and Mulsee, and here joins the Bendoolee river, the chloritic schist is gradually exchanged for more decided argillaceous types. These are sometimes straight laminar, easily splitting into slates, sometimes sublaminar and schistose, in which case the cross fracture is easily obtainable. The former are more frequently of an iron black, the latter of a purplish, reddish, or greenish hue. The two routes here coincide; below Ketee a green schist occurs, remarkable for having two sets of divisions distinctly marked, forming an angle of  $45^{\circ}$  with each other, the one being parallel to the schistose structure; above Ketee again, quartz rock of a bright Orkney yellow occurs, fissured and seamed in all directions, so that a specimen of any size cannot be obtained. The slates too in great part when tried under the blowpipe, fuse into a slag obedient to the magnet. These indications point to an iron mine which is in the neighbourhood, but which I had not an opportunity of examining. The dip in this glen is always N. E., but the strata are nearly vertical, being frequently observed from  $70^{\circ}$  to  $80^{\circ}$ .

227. On the summit of the Pass Dewaluc Khall, quartz rock occurs, and descending thence to Murara, it is found to contain talc; fragments are observed here, which are a mixture of compact felspar and quartz, but the rock has not been observed in situ. Below Murara, micaceous schist is established, the dip being S.  $35^{\circ}$  W., and inclination  $24^{\circ}$ . It is full of small garnets; traces of felspar may be found in it, and I am not without an opinion, that gneiss is to be observed on the summit of the ridge just passed, although in the immediate route quartz rock alone may be visible. The micaceous schist continues to appear along the bed of the Ramgunga. Near Agura, a mass or bed of limestone,

of a siliceous or magnesian character occurs; it contains crystals of dolomite, (brachytypous lime haloide,) and traces of green carbonate of copper (hemi-prismatic habroneme malachite,) also of copper pyrites (pyramidal copper pyrites.) A mine was formerly attempted to be worked here, but either from want of skill or perseverance, was abandoned without any profitable result.

228. A rock occurs here, but in no large masses, which may with perfect propriety be termed a gneiss. It is of a curved or undulated schistose structure, and the composition is heterogeneous or mixed. The ingredients are so disguised, that it is difficult to speak with perfect precision, but it appears to me to contain quartz, felspar, mica and indurated clay. The second ingredient is the most doubtful, and exists in least quantity. Close by this rock is found one of a brownish yellow colour, structure amorphous, composition simple or uniform, and earthy like chalk, tender and friable, traversed by veins of a darker colour, but the same in every other respect. This rock also occupies but a limited space, and is succeeded by a micaceous schist of a blackish blue colour, apparently much charged with argillaceous matter. I should note, that the summits of the surrounding ridges are limestone, recognised with great certainty by their peculiar outline, and mural precipices stained with yellow and black.

229. The preceding particulars apply to the immediate neighbourhood of Mehul Chowra, the halting place below the Pass of Prendooa Khal. In the ascent to the latter, quartz rock and siliceous limestone are found; still higher up, a purple argillaceous schist, containing mica, which graduates into a yellowish white micaceous schist; fragments were found of iron stone and of indurated talc. On the Pass, limestone often highly siliceous or argillaceous prevails, and it is accompanied, as it always is, by its local conglomerates, and its tufaceous deposits or incrustations. On descending from the Pass, a great deal of the same rock is observed, but down in the river valley, it is seen to rest on argillaceous schist, the limestone still continuing to run along the summits, and occasionally descending lower down. It is in the junction of these two rocks that the beds or veins of iron ore occur, which are annually worked, during the healthy season, by emigrants from other parts of the country, who all quit the valley in May, when it is said to become unhealthy.

230. These mines are said to produce metal of a better quality than any others within the mountains, and this circumstance I attribute to the ore having generally a proportion of calcareous matter, which it is well known is one of the best fluxes, the ore itself being of the most common kind, red iron ore, (rhombohedral iron ore of Mohs.) The clay slate in which most of the galleries are situated, is of a peculiar character. It is generally of a reddish or purplish hue, fine grain, not compact, splits into wedge-shaped schist, and with remarkable facility. There is also a cross cleavage which prevents the acquisition of large pieces; the spotted delineations which are sometimes observable in it, when viewed hastily, resemble imbedded nodules. They are always of a lighter colour than the general ground, being usually white or peagreen. The shape is elliptical; when they become very numerous the slate passes into an amorphous rock, which has all the aspect of a conglomerate.

231. From Katsaree to Mehul Chaura, the route turns up a lateral glen, the bed of a feeder of the Ramgunga. The debris is however thick on the mountain sides as well as in the valley, and the rock can only be guessed at; limestone is seen occasionally at the summit of the ridges. Between Mehul Chaura and Dooara, however, the rock appears in the bed of the stream. The first occurrence is that of the purple scaly schist, which seems of a nature intermediate between micaceous and argillaceous schist. It dips to the East of South. This is succeeded by an earthy and subschistose gneiss, which dips S. W.  $10^{\circ}$ , micaceous schist is then found, and resting on it a granitic gneiss which is connected with the series of granite beds so often alluded to, and which will be described presently. The fragments in this valley consist of clay slate, quartz rock; and latterly mica slate, gneiss and hornblende rock, as also chloritic schist.

232. We may now return to Punnae, Art. 67, from which place is another route that has been examined, leading down the valley of the Aluknunda. The granitic rock which I have called greenstone, was noticed, as occurring in the bed of the Dhunpore Nullah; beyond that point the talcose-granular scaly rock is seen to occupy great extent, similar to that which has been described, Art. 221

It is remarkable here for containing much larger concretions than usual; some of them have a perfect resemblance to rounded nodules im-

bedded, and indeed they can be detached from the including base. The rock is therefore certainly of the nature of a conglomerate, and this fact is further proved by the occurrence of rounded nodules of clay slate in an adjoining quartz rock. The concretions of the talcose granular scaly rock are always quartz, but of a peculiar resinous lustre, very unlike ordinary quartz, and in colour always inclining to blue or purple. This rock is a good instance of the deficiency we labor under, from our scanty nomenclature of rocks. It is very well characterised, and has consequently been recognised by me in many and very distant localities, yet we have no name by which to designate it, unless we call it quartz rock. It is singular, that in two of the localities where it has been traced, pieces of clay slate are found imbedded in the adjoining rocks, a phenomenon I have no where else observed. It here passes into the more ordinary quartz, which is occasionally chloritic.

233. The rock at Nugrasoo is the same quartz rock, and it possesses the usual fissured aspect so often noted as characteristic, it being very difficult to detect any thing like the appearance of strata even on the great scale. In proceeding to Tirnee, at one of the lowest points in the route chloritic schist is found dipping to the E. at an angle of  $56^{\circ}$ . Whether a solitary included bed or connected beneath with the extensive strata observed near Punnae, Acend, Jak, and Bendoolee, (Art. 224) is difficult to say, for want of that full access to the junctions of rocks which so often interferes with observations in the mountains. From the little I have myself observed, I am of opinion, that chloritic schist is more generally a member of series than a single formation in itself, at least when we speak of the more decided types, they being seldom found of any extent compared with micaceous or argillaceous schist. The quartz rock passes into the talcose granular scaly rock, thus proving its geological identity; but this would no more absolve us from giving it a name, than it would the several other rocks that graduate into each, but which yet have their distinctive appellations. An imbedded nodule was observed here, (being the largest seen,) weighing at least two and a half pounds, and it was readily detachable after fracture. The existence of conglomerate rocks amongst primary strata has been contended for by many geologists. De Saussure and Mr. Weaver are amongst the best authorities I can just now recollect. Assuredly the aspect of these rocks is at once sufficient to separate them from the

secondary conglomerates, nor could the merest tyro on being shewn both, hesitate to discriminate between them. The most obvious distinction is the less earthy or mechanical appearance of the basis and the greater rarity of the imbedded pieces. Is the conglomerate structure, such at least as it is found in crystalline rocks, one which can in any instance be explained by chemical composition, as affected by the many disturbing causes which may well have been supposed to influence the results? In particular, can we derive any explanation of such a phenomenon from the galvanic energy which we may suppose would be developed by the interstratification of so many heterogeneous, and consequently in some degree anti-polar substances? Assuredly this cause has had more effect than is generally attributed to it in many of our geological phenomena. Whether the present be one which falls within its domain, remains to be determined.

234. Limestone begins to shew itself in detached masses and fragments; and before reaching Tirnee it occupies considerable extent, and is seen crossing the river valley in well marked strata, which dip N. E. It is generally very impure, being mostly argillaceous. At Tirnee, I found blue argillaceous schist; on ascending a ridge the limestone again appears, always argillaceous; descending thence, argillaceous schist is once more established, and continues to Poondaroo village, opposite Roodur Prag, the confluence of the Kalsee with the Aluknunda. It presents some curious appearances, which require a little detail. It is at first of a perfectly white color, soft and earthy, similar in fact to chalk, in all save its schistose structure, and in this respect it perfectly resembles the hard blue slate into which it gradually passes. Below the point where this change has taken place, a mass of the greenstone I have so often had occasion to notice may be seen. There is not any transition to be seen between this rock and the blue slate, but it passes into a green slate, whether chloritic schist or greenstone slate, is difficult to determine. The specific gravity is rather in favor of the latter. That of the greenstone is 3.0, it contains therefore evidently either hornblende or augite (hemi-prismatic augite spar.) Besides this, a light yellowish green mineral may be observed, very much resembling serpentine.

235. In its lower limits it appears to pass into a green quartz rock, coloured no doubt by the same mineral to which it owes its character.



This quartz rock is permanent for a long distance, but assumes various changes of colour. It occasionally appears to pass into a tender green slate, occasionally to oscillate towards the greenstone, and even to hornblende rock. It is sometimes so hard, as to defy the hammer completely. One type appeared to contain felspar, another, a schistose fissured grey rock, containing a few amygdaloidal cavities. It passes into a greenish grey rock, with rhombohedral cleavage, and fine granular composition. These several changes extend as far as Hurkonda glen, in the neighbourhood of which argillaceous schist is again met with, and occasional masses of calcareous tufa and local conglomerate, shewing the proximity of limestone. The schist continues nearly to Soocet, near which a mass of quartz rock occurs. It is seen to descend to the river bed and across it, rising on the other side in strata nearly vertical, the direction E. and W. and the dip if any thing South. The slate again appears, and in the immediate neighbourhood of Soocet, where the valley narrows, it is exchanged for limestone of a very cherty type. It contains crystals of dolomite, (macrotypous lime haloide.) At Soot, the schist is once more established, but appears to have changed its character.

236. It may be seen in the bed of the small Nullah which runs below Soocet, of a perfect talcose aspect, the colors bluish grey, the structure straight laminar, the lustre metallic pearly, and so soft, as to be scratched by the nail. It dips S.  $5^{\circ}$  E., at an angle of  $48^{\circ}$ . It is succeeded, in proceeding towards Sreenuggur, by a greenish grey talco-argillaceous schist, approaching to the character of chloritic schist. The laminae are sometimes very much contorted, being in one particular instance bent up into a saddle-shape, even within the compass of a specimen. This rock is always recognisable by the minute wave-like undulations with which the laminae are marked, and which are peculiar to it. The dip is South along the whole line to Sreenuggur, but the rock so seldom visible that much stress cannot be laid on this determination.

237. Enormous beds of diluvium, or rounded stones and gravel, may be observed here, forming the floor of a valley remarkable in this rugged country for its extent and beauty, though it be but five or six miles long, and no where a mile wide. These accumulations rest on different sides of the river in different parts of this line, so that small as it is, it is not even continuous. Their height above the river bed is ge-

nerally 60 to 100 feet; but with regard to this point it may be observed, that in the widest vallies these beds have least height, and vice versa. Their face generally forms a precipice, in which all the several sizes of stones may be seen sticking in a loose basis of gravel and sand. Sometimes two or three terraces are formed, the last being of considerable height above the bed of the river. In the latter, may be observed the same kind of stones that compose the terraces, leading to the inference that the present opening was once filled up, and that the river must have flowed so much higher than its present level. It is a very remarkable circumstance too in these beds, and shews that there is some connection between their accumulation and the system of rivers, that they increase in extent as the river advances towards the plains; very limited deposits occurring in the upper part of the course.

238. The magnesian clay slate is found at the suspension bridge over the Aluknunda, south of Sreenuggur, while close to the town, in the bed of the river, a rock approaching to the character of micaceous schist prevails. Perhaps it may more properly be called micaceous quartz rock: it also dips to the southward. On ascending from Sreenuggur are seen the accumulations of rounded stones above the present bed of the river, as determined by Barometrical observation. The rock is the magnesian clay slate, which continues the whole way to Pooree, a village on the high range which shuts in the Chipul river. It oscillates both towards micaceous schist and towards talcose, its affinity to the latter being greatest, but no genuine argillaceous schist is produced in any of its changing types. The dip is in general conformable, *i. e.* between N. and E., excepting immediately on the ascent from Sreenuggur, where it was observed to be S.  $10^{\circ}$  E., the inclination being  $60^{\circ}$ .

239. From Pooree to Olee, the road passes along the range above-mentioned, crossing over it near the latter village which is situated a little below in the bifurcations of a glen. Half way the slate is exchanged for quartz rock which appears stratified, dipping  $65^{\circ}$  N. E., at an angle of  $50^{\circ}$ . Here also this rock possesses the veinous character, appearing to traverse the other strata in masses much more remarkable for their length than their breadth. It is seen to cross the valley here, and continue its course on the opposite side; occasionally it appears to contain felspar. It passes into a green type, which gradually changes

to the greenstone so often noticed; but which occupies a very limited space. The quartz rock again becomes established, and continues from Olee to Bidholee, and thence to Milcee, which is situated in the valley of the Nyar river. Near the latter village, a subschistose argillaceous rock occurs, and in the ascent up the valley of the Pilgad, which joins the Nyar below Milcee, the tendency to an argillaceous character increases. In this part of the route, two types seem to divide between them the rocks observed; one may be characterised as argillaceous quartz rock, the other as quartz argillaceous schist. The first cleaves into rhombohedral fragments, has a conchoidal fracture, the composition impalpable; the second has a schistose structure and small granular composition. They run naturally into each other, and may be considered, geologically speaking, as the same rock. The first is seldom stratified, always seamed; the second is generally stratified, although the strata are irregular and appear under that relation termed wedge-shaped. One observation gave the dip N.  $45^{\circ}$  E. with an inclination of  $36^{\circ}$ . Not far from this the dip was observed N.  $80^{\circ}$  to  $90^{\circ}$  E., inclination  $40^{\circ}$ . The quartzose type prevails to some distance above Bidholee, and is gradually changes in the ascent from the bed of the stream to an argillaceous schist of more decided character. The latter passes into chloritic schist, which conducts us to strata of gneiss connected with the series of granite beds, to which we shall presently come.

240. In the meantime, it will be necessary once more to look back and take up the thread of our description broken off in Art. 159, and to trace the argillaceous strata in another direction at the village of Girgaon where the last traces of gneiss were lost, although in the river-bed beneath occur numerous blocks of that rock. The character of the formation which succeeds is argillaceous, including, however, extensive beds of limestone; sometimes there is a kind of transition observable between them. This continues without much variation as far as the hot spring below Rumaree on the Ramgunga, into which the Jankoola river (below Girgaon,) falls. At the bridge over the Ramgunga the rock is clay slate, and dips N.  $15^{\circ}$  W., at an angle of  $35^{\circ}$ . The ridges appear to consist of limestone stratified distinctly, and dipping also N. W. Above Rumaree, argillaceous schist occurs of a lead blue colour, containing quartz; fragments of a conglomerate are then met with, and latterly in the ascent to the Pass above Sama, a brownish granular

schist, which might be called a greywacke. On the summit of the Pass, there is no rock in situ, and fragments of micaceous schist are to be seen. Thence to the village of Sama, we are accompanied by ordinary blue limestone, distinctly stratified, and of a sublaminar or slaty structure, which is not, however, developed without weathering.

241. From Sama to Buret, the same rock prevails, frequently remarkable for the white vein by which it is traversed. Sometimes the two colours, form alternate layers, the rock having thus a striped appearance. It is occasionally very argillaceous, and passes into a shattery thin laminar rock, very like that described in Art. 226, the only difference being a black or blue colour, instead of red, green, or purple. In this state, it no longer effervesces with acids. In the bed of the stream leading down from Sama, the fragments are either blue limestone or crystalline dolomite, or of clay slate a very few; but at the bifurcation below Mawgaon, immense blocks of gneiss, similar to those observed below Girgaon, are to be seen. Their source is evidently in the glen, which here joins the Suma glen, and they shew the proximity of the boundary of the gneiss district.

242. From Buret to Kubkot on the Surjoo, limestone still accompanies, as passing down the Ramgunga to its confluence with the Surjoo, and then down the latter river. It appears to be stratified distinctly on the large scale, the strata being always best marked where the rock is most impure. They appear sometimes to be vertical, and the direction, as far as it could be ascertained, is S. 20° E. Sometimes it contains talc in notable quantity, and then the rock is highly fissile. The rounded fragments in the bed of the river are numerous, and many of these are white crystalline dolomite, (macrotypous lime haloid.) Near Kubkot, the dip was observed to be Southerly, so that there must be evidently some great irregularity here. The sameness of the limestone features continues to Gryket, also in the bed of the river, the surrounding ridges bearing testimony by their appearance to their identity with the lower strata, occasional patches of argillaceous schist then diversify it, although it is still the prevailing rock. The fragments in the river bed consist of limestone and quartz rock. A small patch of black argillaceous schist is found a few miles above Bagesur, the place being further remarkable for the deep bed the river has worn in the limestone, hollowing it out into caverns and deep holes, in some of

which it has a depth of perhaps 30 feet or more ; although at Bagesur, some miles below this point, it is fordable, being scarcely three feet in depth. The tendency of this rock to be worn into caverns and hollows is a very curious feature, nor am I aware that any satisfactory explanation has been given of it. The dip at this place was observed to be S. 30° W., and the inclination 52°.

243. Hence to Bagesur, one of those extensive flats so often formed in the river beds prevails, nor is any rock in situ discoverable ; at that place the strata are quartz rock, and they dip N. E. The river bed is full of rounded limestone fragments, but below the confluence of the Goamuttee, which originates in the valley described in Art. 65, the fragments are as often gneiss and quartz rock. Another extensive flat reaches from this point for nearly two miles, and debars access to the rock. At its termination, calcareous tufa and conglomerate are seen, but not apparently of great extent. A third flat then occurs, and after passing it, argillaceous schist is established, and it continues in the ascent to the Cheer Nullah, a small stream which comes down from the range separating the vallies of the Surjoo and Cosillah. We have then a limestone of a yellow color and fine granular, containing a large proportion of talc, and a little higher up, nests of indurated talc are found of a light buff colour. Thence, argillaceous schist and limestone are irregularly mixed, the latter forming the summit of the range. It is of a magnesian character when pure, being in fact a compact dolomite ; but is generally so much charged with siliceous matter, as to become a kind of chert. In its pure magnesian state too, it has no inconsiderable resemblance to the latter rock. The colour is a bluish grey, which occasionally changes to flesh colour. It contains veins of galena, (hexahedral lead glance.) The strata when observable, appear to dip N. 60° E., at an angle of 60°.

244. In descending from this range, argillaceous schist is again met with of a very soft type, and of various bright colours, similar in fact, to the rock observed in the Cosillah, (Art. 152.) The strata are so irregular in dip that no mean result can be attained. It sometimes contains quartz. In ascending to the Kurnyud Pass, micaceous schist occurs, and occasionally with felspar ; fragments of gneiss are abundant. Descending from this Pass into the Suttralie glen, we find an earthy gneiss, very similar to that described in Art. 134, which prevails in the

Goamuttee valley. This rock dips S.  $33^{\circ}$  E., at an angle of  $38^{\circ}$ . Here also may be seen a brown amorphous rock, of a very anomalous character, the true relations of which further enquiry is wanting to develop. A little further, micaceous schist, covered with an aluminous efflorescence, dips S. S. E. This latter rock continues to the foot of the ascent, occasionally taking in a little felspar. In the ascent to the Pass above Bhynsoolee, gneiss is again found in strata nearly vertical, containing beds of hornblende schist, and having here again come upon the tract connected with the series of granite beds, we shall once more leave off, and pursue two other short lines of route, which yet remain to be described previously to entering on those details.

245. The first of these leads from the bridge over the Kalee at Joolghat to Lohooghat, the cantonment of the 2d Nusseree Battalion of Ghoorkhas. At the bridge, strata of a very pure limestone occupy the bed of the river, and form unexceptionable natural piers for this structure. The dip was N. E. In ascending, detached masses of compact limestone and conglomerate, (enclosing pieces of quartz rock and clay slate,) are seen; a good deal of stalagmitic and stalactitic incrustations are noticed, shewing that masses of limestone are doubtless prevalent, though from the nature of the surface not always visible. At Booralee, or a few miles before coming to that village, a purple argillaceous schist makes its appearance; some of the types are granular, and might be called a greywacke schist. It also passes into a compact slate of a light yellow or greenish colour, very similar to hone slate; as such it has been used, and found to answer. These rocks occupy the road as far as Petorahgurh, and the dip is generally N. or a little W.

246. At Petorahgurh, patches of limestone are found in it of a pure type and blue colour. This rock, as has been often observed in limestones, has a sublaminar structure, weathering so as to have often the appearance, in detached pieces, of a series of layers or thick leaves joined together. It sometimes divides into thin slabs, which are, however, very unlike the slates of an argillaceous character, as they admit of a cross fracture with great facility, which is as usual conchoidal, and not hackly like that of the latter rock. The schist here is very variable in aspect, yet never loses its argillaceous character. At the cantonment, it is quite soft, and might pass for a yellowish clay were it not disposed in slates, which however will not bear handling, as they fall to pieces

immediately being minutely intersected by cleavages, the effect of which is to resolve them into rhombohedral fragments on the slightest impulse being communicated. The small hill on which fort Loudon is built consists of this rock, and on its summit, lay some very large boulders of a very tough and hard greenstone, the removal of which occasioned the Officers employed in clearing the ground, not a little trouble.

247. This rock I call greenstone, for it has not the smallest resemblance to hornblende rock in appearance. I have already mentioned its frequent occurrence in tracts of argillaceous schist, and I shall endeavour here to collect all the particulars I have observed with regard to it. It is a composite rock, consisting of two distinct substances, the one a dark olive green, the other a lighter colour, more perhaps of a greenish grey. The structure is small grained granitic; that is to say the minerals are obviously distinct, while yet they are in perfect contact throughout. The fracture is subconchoidal, taking its character in the small from the size of grain which it discloses. It is very hard, and in toughness I know not its equal. The specific gravity is upwards of 3.0, sometimes as high as 3.2. It is very fusible under the blow-pipe, and will bear drawing out into threads similarly to glass. If there be really a distinct species of felspar which has been hitherto described as the compact, I should be inclined to view the lighter coloured ingredient as an example of it. The dark one is either hornblende or augite, but the grain is too small to allow of a satisfactory determination.

248. This rock is not seen here in situ; these blocks being the only traces of it, but in other places, as already detailed, regular gradations occur, uniting it with the most ordinary schistose rocks, very frequently the transition is made through quartz rock; altogether it is a very interesting member of our mountain strata, and the full developement of all its relations is a task the execution of which I expect will throw considerable light on some interesting questions in geology.

249. From Pctorahgurh in the descent to Surjoo, argillaceous schist is the prevalent rock, indeed the only one, with the exception of a few beds of limestone. It is mostly of the type just described, (Art. 246), but some others are also met with. In particular one, having a suite of colours between olive and bright red, in hardness about equal to gypsum,

splitting generally into slates of moderate thickness, but which are often curved, smooth to the feeling, and having a slight degree of lustre. I think this type owes its peculiar character to the magnesia it contains. It is found between Petorah and Goon; near the latter place, it is succeeded by a yellow rotten stone, which has apparently originated in an argillaceous rock of a less schistose character, or perhaps even in calcareo-argillaceous strata. It is remarkable for its rhombohedral cleavages, breaking into fragments of that shape on the application of the hammer. It is of arenaceous composition, and its specific gravity is very low, about 1.5. In its vicinity are found small masses of a soft argillaceous limestone, of a light olive colour, which might perhaps be of use in lithography. They form the only type of limestone I have met with in these mountains which hold out any prospect of being available for the purposes of that art. In general, the lithographic stones used in Europe are derived from the secondary strata, and even in these, the properties essential to the most perfect specimens seem to be peculiar to a very small tract in Germany, neither France nor England having yet furnished stones to compete with those of the former country.

250. The soft magnesian clay slate of different colours, which is found near Goon, also prevails at Doodar. On the ascent to the Thakil Peak, which lies a little to the left of the route from Petorah to Lohooghat below that village, a bluish grey schist, of a shining lustre is found, traversed by white veins. In ascending from Doodar to the Peak, the rotten stone noticed near Goon, and of a bright ochrey, colour occurs, but undistinguished by the peculiar structure of that rock, the present one giving an amorphous irregular fracture. Above this, lies a fine greywacke schist of a dark blackish grey colour, which passes into a rock that strikes fire with steel. The summit of the peak is a silicious limestone that occasionally passes into schist. It projects in amorphous weather-worn nodules, and is full of veins of flint (var. rhombohedral quartz.) This is not a common mineral, at least in the form of veins, to be found in limestone. It is of two kinds: the one a dark brown, exactly similar to the ordinary gun flints, the other a white opaque substance, occasionally becoming translucent, and not very unlike the mineral called cacholong. These veins are more persistent than the bulk of the rock, which indeed appears



to be singularly subject to atmospheric wear; the consequence of this difference of durability is the projection of these veins on the surface of the rock, giving it a singularly rugged appearance. It is probable also, that particular parts of the rock not veinous in appearance, partake of this durability, and thus occasion that nodular aspect so characteristic of this limestone.

251. Is there any connection between a primary limestone with veins of flint, and the chalk strata enclosing rolled pebbles of the same mineral? The occurrence of flint pebbles in chalk has always appeared amongst the wonders of geology to the uninitiated. The difference of composition between chalk and primary limestone is perhaps as great as one, and not a little difficult to account for. The primary limestones we see, however, are subject to a caries, which as far as it goes, produces a perfect chalk. In that state it is obvious that the action of any of the numerous causes of the disintegration of rocks will be more powerful. If we then suppose that the flint being set loose, splits into numerous fragments of all sizes, and will, by the same cause that transports the loose chalky matter, be worn down on its edges and at last rounded, we shall perhaps have an explanation not at all improbable. If this be not an exact account of the phenomena, it at least, by shewing how natural and simple the process which might have produced the actual state of things, serves to take off some of the edge of our wonder.

252. In descending to the Surjoo from Goon, we find argillaceous schist occasionally of the same character as that observed in the ascent to the Thakil Peak, (greywacke schist.) It is, like that, of a dark grey colour approaching to black, and is remarkable for splitting into prismatic fragments on being struck. A good deal of calcareous stalagmite occurs, and a soft white or light grey schist, intermediate between clay slate and talc slate. Latterly, limestone is abundant, and in the bed of the river we have gneiss and quartz rock, with fragments of hornblende rock in addition to those of limestone and the two preceding. The gneiss continues from the bridge upwards, at first of a fine grain afterwards coarser, and containing superadded amygdaloidal concretions of felspar, similar in fact to the type described, Art. 80. Beds of mica slate and of quartz rock are contained in it; the latter furnished the only observation of the dip which was S.  $30^{\circ}$  E. and inclination  $60^{\circ}$ . At Burakot, argillaceous strata again prevail, and furnish some very anomalous rocks

in their several changes of type. A dark grey almost amorphous rock, with fine granular composition, conchoidal fracture, very hard, but rather brittle, which occurs near Burakot, is one of the most remarkable. Were it not for the decided absence of the arenaceous structure, I should be inclined to term it a greywacke. It contains, I think, carbonate of lime as one of the ingredients. It passes into a perfect roofing slate, which is found in great abundance just below the cantonment. Here we come upon the line of route which belongs to the description of the granite formation, and we must therefore return to Petorahgurh, to finish the details of the route thence to Almorah.

253. In the ascent to the ridge just above Petorah, the new road gives excellent views of the strata, and it were much to be wished, we could elsewhere gain the same access to the rocks as we do here. The soft and clayey rock of the cantonment appears to pass into a dark black rock of sublaminar structure. It breaks with an uneven, irregular, rather than a conchoidal fracture. It is often stained in the interior of a light ash grey colour, very similar in appearance to a piece of half-burned charcoal. At the summit of the Pass dolomite of a large crystalline grain occurs. It contains veins of indurated talc, (var. prismatic talc mica,) and also of very fine large rhombohedral crystals of dolomite, (macrotypous lime haloide.) The indurated talc is of various colours, but most commonly jet black, a variety not noticed by any of our mineralogical writers. It assumes a very good polish, and would form a very beautiful material for small ornaments for a table or chimney piece. It is not however in any quantity.

254. The dolomite is evidently a bed in the slate, for almost immediately on descending the Pass, the latter rock again occurs. It is here of a white colour, and of micaceous composition, but still slaty in structure. It is again exchanged for the black rock with light grey stains. The debris here consists of a very fine ochrey clay of a good colour, and which might be useful in the arts if prepared properly; besides the bed of dolomite, beds of talc slate are found, and in this rock is situated the copper mine, which is, however, worked on a very small scale, producing only 50 Rupees per annum. The argillaceous schist continues down this valley, (Shor Goorung,) irregularly intermixed with dolomite, which is very often compact, containing veins of the crystallised mineral, and very often appears to pass into the slate. It can seldom be seen in

well-defined strata, rather appearing like amorphous projecting masses, unless when impure, and then the strata are as well marked as those of the better defined schists. In two instances, the dip was observed N. E., inclination  $20^{\circ}$ , and N. N. E., inclination  $32^{\circ}$ . The first of these was a purple arenaceous rock, containing a good deal of carbonate of lime, the second was an almost pure compact dolomite of a light grey, and remarkable for its conchoidal fracture, toughness, and hardness.

255. In the descent to the bed of the Ramgunga, chloritic schist of a perfectly pure type occurs, being in fact green talc slate; it contains metallic copper disseminated, but no attempt has been made to work it. In the bed of the river a schist occurs, which may well be called talcose schist, being a mixture of quartz and talc. It bears the same relation to talc, (prismatic talc mica,) as rhombohedral talc mica. It is in this particular place schistose, and distinctly stratified; but in other quarters, it passes into a massive rock, bearing the same relation to it, which ordinary quartz rock bears to the above schist. It is in fact a talcose quartz rock, as we may call the ordinary type micaceous quartz rock. The titles talcose and micaceous schist might be confined to the schistose types of this compound rock, and that of talcose slate, to the slate composed entirely of indurated talc. This would introduce some precision into our account of rocks. In like manner, chloritic slate should be reserved for the pure mineral, and chloritic schist for the compound types. Without a reform, terminology will never make any real progress.

256. From the bed of the Ramgunga, the route ascends to Gungolee Hath, on the valley of that river from that of the Surjoo. The talcose schist passes into a quartz rock in which the talc is gradually lost, until it at length very closely resembles a sandstone in appearance, argillaceous schist then establishes itself, but whether by transition or per saltum, the state of the surface does not admit of deciding. The dip was observed to be N.  $7^{\circ}$  E., inclination  $45^{\circ}$ . Towards the summit of the ridge, magnesian and siliceous limestones begin to prevail, and the crest is entirely composed of a flesh-coloured dolomite, with purple clouded delineations, which I think would form a very handsome material for various ornamental works, as it takes a very high polish, and is not more difficult to cut than ordinary marble. It is traversed by veins of a purplish brown calcareous spar with curved

cleavage, and so strong a pearly lustre, as to be at first mistaken for dolomite spar, (macrotypous lime haloide,) but its specific gravity and ready effervescence with acids, shew it to be rhombohedral lime haloide : veins of a resinous quartz ; bluish, black and white, are also observable.

257. In descending to the Surjoo, a little blue limestone is seen, and one patch very beautifully variegated with yellow veins of carbonate of lime. The prevailing rock, however, is argillaceous schist ; a good deal of what might, in following up the distinction, (Art. 246), be called clay slate also prevails, soft and distinguished by its series of colours as well as by its patches of a different colour from that of the ground. At the bridge, the rock dips S. W. In ascending from the river, an impure hornblende rock begins to appear, remarkable for its numerous cleavage places, which render it so difficult to distinguish the lines of the strata. Hornblende and actynolite schist are found, and a white massy rock, which from a cursory examination, I supposed to be a compound of tremolite and quartz, as the three substances, hornblende, actynolite and tremolite really constitute but one species, (hemi-prismatic augite spar,) there is nothing improbable in this opinion. I have to regret in this, as in many other instances, the want of access to the specimens collected, in drawing up this paper, which prevents me from revising particulars of this description, stated hypothetically in my note book.

258. The hornblende schist ceases a little above the village of Neoolagoon, and is succeeded by gneiss, which is of a porphyritic type, containing superadded prismatic nodules of felspar. This mineral in every case appears to be of greater durability than the basis or ground, and the nodules consequently remain projecting after the other has in a measure disintegrated, giving the rock an exceedingly uneven and rugged surface. The dip was observed to be S. W. Near Jagesur, this gneiss is succeeded by micaceous schist, dipping to S. S. W., with an inclination of 60° above Jagesur. On the Pass the dip had changed S. W. This rock continues to Almorah, and presents nothing very worthy of remark along this line. Near Chandeswur, it dips to S. S. E., with an inclination of about 15°. A few miles from this, it contains beds of brown iron ore, (prismatic iron ore,) which are said to furnish a very good metal. The ore contains a little manganese, rolled pieces composed of grains of quartz sand, and octohedral crystals of magnetic iron ore (octohedral iron ore,) are

found scattered about the surface of a hill in the vicinity of this mine, but no trace could be obtained of a deposit in situ. These pieces are all natural magnets, and have two or more poles according to their shape. Under Kaleenath, the schist becomes highly carburetted and soils strongly; some pieces are white, and on the summit of the ridge where the carburetted type entirely prevails, nodules of graphite are found. The dip in this vicinity changes to N.  $44^{\circ}$  and N.  $22^{\circ}$  W., the inclination being  $45^{\circ}$  and  $30^{\circ}$ . The rock is latterly extremely like a sandstone, and so friable, that no specimen is obtainable.

259. A short line yet remains to complete the details of the schistose band of rocks, previously to entering on the description of the granite beds. It is the route followed in an excursion from Petorahgurrh to visit the copper mines. At Seera, argillaceous schist prevails for the first few miles, to which succeed dolomitic rocks of very variable appearance and grain. Occasionally, they are of very loose aggregation, and crumble to pieces in attempting to procure a specimen, occasionally though these latter are chiefly fragments. In the bed of the river they are so hard and tough that the hammer will scarcely make any impression on them. In every case the grain is crystalline, but very various in size, even within the limits of a hand specimen. Clay slate occurs of a deep iron black colour with straight laminae, very hard and very brittle. It has a kind of iridescent tarnish, sometimes, on the face of cleavage. Near Kinder Besool, the limestone rocks, less decidedly dolomitic, continue mixed irregularly amongst patches of slate.

260. The route now ascends to Dhurmurrh, situated on the ridge which overlooks the Seera valley, carrying clay slate along that line, and then descends to the mines, which are immediately below the Pass. They are situated in a formation, or bed I should rather call it, for the former term is too general, in which indurated talc, (potstone and talc slate of geologists,) and crystalline granular dolomite are irregularly mixed. They must indeed here be considered as the same rock, geologically speaking, for they mutually interfere; and hand specimens may be obtained in which both substances are separately observable as well as in mixture; access is wanting to the junction of this bed with the surrounding slate, so that its exact nature cannot be ascertained, that is to say, whether it be really a bed or vein. The copper ore is most commonly copper pyrites, (pyramidal copper pyrites,) and it is

associated with iron pyrites, (hexahedral iron pyrites.) These minerals, particularly the latter, are often found imbedded in the potstone. Some part of the galleries are cut in the dolomite rock, part in the potstone, as the two rocks are continually interchanging, so that a gallery begun in the former will, after 20 or 30 yards, be found to be in the latter. The copper evidently traverses both rocks, and as far as the miners' accounts can be trusted, is in veins.

261. Till the publication of Professor Moh's system, great confusion existed on the subject of these two mineral species. We have in some of our most approved system-mongers, long and laboured articles, consisting of many pages of description, tending to shew, that massive talc was something different from potstone, and these again from soapstone; yet if we examine their several qualities, we shall find them identical. Professor Mohs, with the judgment which he has shewn throughout his work, at once rejected futile distinctions that were without differences, and has not hesitated to connect, as mere varieties, scaly talc and potstone. The truth of his views, if they required confirmation, would be found every where in these mountains, where an uninterrupted series of gradations may be traced, from the most perfectly amorphous potstone, through talc slate to the scaly mineral, usually considered a distinct species. Previously to the publication of that excellent work I had found so much difficulty in reconciling the contradictory accounts of mineralogists, that I determined to form a collection of the various types of this mineral, and in consequence, had satisfied myself, that there is in reality no difference whatever in essential character amongst the varieties, which hitherto have figured as distinct species. The inaccurate determination of specific gravities by early writers, servilely copied by their successors, has been partly the cause of this and many other of the opprobria of mineralogy. The following determination of this element, obtained from the specimens above alluded to, will serve to shew, how absolutely the same it is in the different varieties, and to confirm the accuracy of the limits fixed by Professor Mohs, viz. 2.7, 2.8.

White potstone, (Seera Mine,) .. .. .	2.712
Black ditto, (Shergarury,) .. .. .	2.76
Greyish ditto, (Seera,) .. .. .	2.76
Yellowish soapstone, (Kuree,) .. .. .	2.79
Do. very steatic, (ditto,) .. .. .	2.74

Indurated talc, (Government Collection,) . . . . . 2.77

Ditto, a second specimen, . . . . . 2.7765

All these had precisely the same degree of hardness.

262. The dolomite has been equally well discriminated, and correctly fixed by the Professor. The accounts of previous writers only serve to confound the student with tenfold perplexity, from which he is only extricated by his clear views, and precise determinations. That they will very much tend to raise the character of a science, which till his book appeared was but empiricism, is obvious. Of their utility to the student I can myself bear witness, and this very mineral, as well as calcareous spar affords many instances. The limits of the latter are fixed at 2.5 and 2.8, of the former at 2.8 and 2.95. The following are some determinations I made :—

Grey compact dolomite, . . . . . 2.826 Pass, road to Bagsar  
above Belowree.

Greyish white dolomite spar, . . . . . 2.850 Goorung.

Yellowish grey ditto, . . . . . 2.99 Bed of Mahepore.

Dolomite spar large rombohedral, . . . . . 2.83 Shor Gorung.

Compact dolomite, purple, . . . . . 2.83 Gungolee Hat, h.

Of these the third only exceeds the limits, and this by so small a quantity, that it is very likely a revision would bring it equally with the others under those limits. The veins of purplish brown calcareous spar, which are found in the Gungolee dolomite, have the external characters of dolomite spar quite perfect; that is to say, pearly lustre, opacity, and curved or ill-defined cleavage. Being also contained within a magnesian rock, I naturally placed it amongst the specimens of dolomite, but in determining its specific gravity as one of the above list, I found it to be only 2.67. A re-examination and the test of acids satisfied me, that it was really calcareous spar. This is one amongst a hundred instances in which external characters alone are found perfectly inefficient to discriminate minerals, nor is there any thing in the history of science more truly surprising than the pertinacity with which mineralogists have hitherto resisted putting their system on the secure basis of numerical determination.

263. Below the mine, very beautiful massive talc of a snowy whiteness occurs, mixed with unequally white crystalline dolomite. The former is, however, intermixed by rents or fissures, preventing the acqui-

tion of a small piece even applicable to the purposes of the arts. It passes into a yellowish grey talc slate, in straight laminae a very beautiful rock. The white indurated talc is also found associated with nodules of quartz, the former being disposed in layers round the latter. A blue limestone succeeds in nearly horizontal strata. It contains disseminated talc. We have then a talco-argillaceous schist, and thence siliceous limestone, and white fine granular dolomite in various intermixtures and transitions to the foot of the great Dhuja Peak. Nearly half way up, we observe a talco-calcareous schist in moderately thin laminae of a yellowish colour, the dip being to E. It is crowned by a purplish grey micaceous schist of well marked character. In descending on the other side, a very beautiful white fine granular dolomite, clouded with green tints, is found, a rock that would furnish a very elegant marble. Argillaceous schist is then established, and continues very nearly to the descent into the valley under Petorahgurh. Limestone then occupies the ground just at the edge of the descent, and on this side the valley, argillaceous schist, as before noticed, is again the rock.

264. It is now time to consider the granite beds, and we may do so in the most regular manner, as well as fill up some details still wanting in the schists, by pursuing a line from Chumpawut to the point where we left off in Art. 231. This route forms almost a straight line, and it is singular enough, that it is parallel to the direction of the mountain land and of the strata, as may be seen by examining the map. Such a coincidence, to say the least, is curious, and cannot fail to excite in a speculating mind a desire to trace in this common relation, some evidence of a community of origin. At Chumpawut, the most eastern of our beds of granite makes its appearance. It would seem to be precisely the same rock that in Cornwall is called *granan*, being a loosely aggregated amorphous mass, with the ingredients and structure of granite, but so soft, as to bear being dug like clay or mould. It is remarkable for its great proportion of felspar, and small quantity of mica. This soft ground is strewn over with large imperfectly rounded blocks, of a very hard and beautiful granite. It is of a smaller grain than the *granan*, and much more crystalline. The felspar is white, the mica black, and the quartz yellow or brown. The blocks are sometimes observed to have a superficial layer or crust separating



from them, not in any thing like a decomposing slate, but equally hard and equally beautiful with the body of the mass ; nor is it easy to understand, what is the cause of this separation. Some further details will be brought forward when we come to the Dhee bed. At present, we may go on to say, that the eastern boundary of the Chumpawut bed has not yet been traced. To the West, it is succeeded by micaceous argillaceous schist, which passes immediately into well-defined argillaceous strata. These continue to Lohooghat cantonment.

265. It is scarcely necessary, after the long details already given of this rock, to enter into any more ; it may be therefore sufficient to say, that it is a fine, granular, grey, compact, blue, chloritic, arenaceous and earthy, most probably the result of decomposition, as though perfectly soft and little differing from clay, it has yet the laminar structure distinctly marked. Near the cantonment in the bed of the stream by the bridge, it approaches to a greywacke, and is full of quartz veins. It contains, I think, felspar, certainly mica and quartz, but the composition is arenaceous. It dips to N. E., and at an angle of  $54^{\circ}$ . In the cantonment as before noticed, excellent roofing slate abounds, of which circumstance the officers have taken advantage in building. The granular type containing much quartz, and sometimes chlorite, continues as far as the bed of the stream below Furkah. There a quartz rock is seen distinctly stratified, dipping N. E.  $15^{\circ}$ , at an angle of  $54^{\circ}$ . This rock contains felspar, and might almost be called a quartzose gneiss. Ascending hence to Farkah, the granan begins to establish itself, till at that place it is perceived that we are arrived at another granite bed, situated almost exactly in the hypothetically drawn line through Chumpawut, parallel to the direction of the strata.

266. The character of the rock which composes this bed, is precisely that already described. The same excess of felspar, the same soft crumbly material, in fact a perfect granan. In the vicinity of Furkah, there is a mass of limited extent, consisting almost wholly of felspar, which it would seem is stratified ; but with this exception, the whole of the country for many miles, presents the same roundish projecting amorphous masses. The large blocks are not so common in this tract as at Chumpawut, but towards Dhee they become very numerous, and of enormous size. Here it is that the circumstances of their desquamation may be best studied, and some light thrown on their nature and

origin. The ground is still the same granan, equally soft, equally abounding in felspar as at the two former places ; but the blocks are of superior hardness, and have not any sign or trace of disintegration. The crusts may be seen in every stage, just beginning to separate, or having made considerable progress ; a large layer, of a thickness seldom exceeding half an inch seems waiting any impulse, or perhaps the further action of the same cause to detach it entirely. These form the only means of obtaining specimens, so hard and so round are the blocks where this phenomenon is going on. The view of the process in all its different stages satisfied me at once that these boulders originated in the granan being but the harder and more durable nodules of a soft rock, which has gradually wasted away, and left them as monuments of the extensive waste the surface has undergone. This view is confirmed by an examination of a very large one that lies to the S. W. of the temple, and which presents a set of appearances worth recording. It is of an irregular spherorhomboidal shape, and not less than 60 feet in diameter. It rests on the granan, and its connection with the latter is the circumstance which forms the interest. The block itself is very hard at its base ; it is well-defined by a seam which separates it from a layer of a softer granite that is divided by seams into numerous flakes, which all follow the curvature of the boulder. It is not the change of hardness that forms the boundary of the latter, but a distinct seam or separation. The flakes immediately adjoining it are very thin ; they gradually increase in thickness as they diminish in hardness, till in a space of five or six feet the seams disappear, and the soft granan of the surrounding surface is established. The rock is in some measure overhanging, the soft layers having been cleared away probably for the purpose of forming a cave or shelter for the numerous flocks and herds that graze here at particular seasons, so that the structure and arrangement of the thing is perfectly exhibited. My figure may give a clearer idea than any verbal description can.

267. The correct boundaries of this granan tract have not yet been fixed on every side, but it is inferred that the extent of it is very limited in a North and South direction. In proceeding to visit the iron mine at Muglig, which is in the latter quarter, I found it pass into a very regular micaceous schist, in a distance of 6 miles. This schist dips to the North, that is, towards the granite, and at rather a

high angle, of  $55^{\circ}$ . At Kande, a small village about that distance below Dhoora Peak, mica slate is established, and continues to the mine where it contains a bed of limestone, in which rock the mine appears to be situated. Some of the best specimens of calcareous spar are obtainable here, though great part of the limestone itself is very impure, containing 20 per cent. of foreign matter. At the mine, it appears to be stratified, and dips  $55^{\circ}$  N., at an angle of  $34^{\circ}$ . The ore is in the form of a vein, to judge from the miner's descriptions. It is of a brownish black colour, granular composition, very hard, and breaks with a conchoidal fracture. It is not magnetic, or at least only very slightly. The specific gravity is 3.7 to 4.0, but as it is obviously contaminated with some foreign ingredient, this determination is too low. It is most probably (the pure part) titanitic iron, (axotomous iron ore.) It is very imperfectly smelted, and sold in a spongy impure state, at the rate of a maund for a Rupee.

268. A remarkable feature in the granan is the number of veins it contains. These consist almost wholly of felspar and quartz, the former mineral forming the larger proportion, for it is always of an opaque aspect, apparently impure, very cleavable, so as to prevent the acquisition of specimens of any size. This structure I think it owes to its impurity, and that it is the intervention of the quartz which occasions its separation into fragments. There are other veins which are to be observed also in the hardest blocks. This is a granite of a finer grain, which is sometimes seen to traverse the great boulders, or large round fragments, and they are like most veins separated by a strong line from the surrounding base or ground. Some few imperfect quartz crystals have been found. Epidote has occurred in company with ill-defined large crystals of white opaque felspar; schorl is found in abundance. In one instance it forms a very large vein in a bed of quartz rock. But the most interesting inhabitant of this singular rock is yet wanting to complete its resemblance to the granan of Cornwall. Tin has never been found in it, though as the oxide and sulphuret of this metal are so unlike the general run of metallic ores, it is possible the non-discovery of it may be owing to the ignorance of the people concerning the value or appearance of such mineral.

269. The granite continues to Sarput-ka-Dhoora in a direction a little beyond which it gives place to gneiss, and this to mica slate,

which appears to pass into a greywacke. About half way between this spot and Dhol, (the regular stage,) a number of rocky masses occur, very striking both by their magnitude and apparent disorder. They are all fragments of gneiss strata, one (the longest) has something of a pyramidal shape, very similar to a rock noticed by Dr. Macculloch (also of gneiss,) in Skye. It here performs the part which he supposes the Skye rock would, were it transported to the plains of Hindoostan. It is worshipped under the title of Nag Deo. It is at least fifty feet in height, and twenty to thirty broad at the base, and has no fissure or line of strata, or separation throughout. Gneiss in situ is also found in this neighbourhood, mica slate again succeeds, of an ordinary type, and continues nearly to Dhol.

270. At Dhol, it passes into a singular rock requiring a little detail. This rock is of an earthy composition, and quite soft, though preserving the appearance of strata, and of laminar or schistose structure. It contains in its transitions into ordinary mica slate more or less of this mineral; but in its best defined types very little, if any, is to be seen. It is of various colours: black, red, yellow, grey, white, always bright and well defined. The black is the most abundant, the white the least so. It is very absorbent of water. In a piece weighing 205 grains, it amounted to 28 grains; on another of 191, 30 grains; allowing for the absorption the specific gravity was found to be 1.95 and 2.01. The black variety generally dull, but occasionally with some lustre, is infusible, burning under the blowpipe to a white ash. Some portions, however, do fuse into a black slag, attractable by the magnet. It is slowly soluble in borax, occasioning effervescence, but imparts no colour to the bead. The red variety under the blowpipe turns black, and with a continuation of heat, part fuses into a magnetic slag, part burns to a white ash; muriatic acid, whether concentrated or diluted and even with the assistance of a boiling heat, has no effect. Of the existence of a very large proportion of carbon in this rock, the foregoing particulars leave no doubt. The inference that it contains beds or veins of graphite is a natural consequence, rendered almost certain by the occurrence of the mineral in a similar rock to be noticed afterwards. The great variety of rather decided colours in it gives this district a peculiar appearance. So bright are the reds and yellows, that I think very excellent colours might be manufactured from them. The

people of the country had their attention excited by this circumstance, and attempted to obtain iron from it, which they supposed to be indicated by the red, yellow, and black colours. Failing in this, they do not appear to have sought for any thing else.

271. The micaceous schist again assumes its ordinary character on the road to Bandunee Dihee, and is observed to dip N. E.  $25^{\circ}$ , at an inclination of  $35^{\circ}$ . On the summit of that Peak, which forms a plane 200 by 20 yards, strata of garnetiferous schist are seen projecting. The dip  $30^{\circ}$  N. E., inclination  $35^{\circ}$ . In the descent to the stream, it changes to a talco-micaceous schist, of a pale lead grey colour, very soft, and almost steatitic, with curved laminae, and passing into a white clay. It contains nodules and grains of glassy quartz. The dip is North, the inclination  $30^{\circ}$ . In the bed of the stream, the strata which are of the ordinary character, dip  $14^{\circ}$  S. of E., the inclination being only  $17^{\circ}$ . Ascending thence, we have micaceous schist, which continues to the cantonment; the dip being generally between N. and E., and the inclination small. This schist is remarkable for its great variety of type, even within the limits of so small a space as the cantonment; 1. yellowish brown, scaly, tender; 2. quartzose, grey, in tolerably straight but thick slates, the two materials being disposed in layers; 3. less quartzose, in thick large schists, with an undulated surface; 4. blue or dark grey approaching to the character of gneiss, and occasionally containing very small portions of crystalline felspar; 5. a soft arenaceous mass, which on exposure to the air, falls into sand. These are amongst the most remarkable. The addition of garnets introduces many other varieties. This schist is also to be noted as containing veins of granite of a very regular type, and also of felspar in a semi-disintegrated slate, and of snowy whiteness. The latter might be also called a granite, as it contains quartz, and even mica; but the former is in small quantity, and the latter consists of a few solitary scales disseminated.

272. The ridge on which Almorah is situated, rises into the Peak of Kaleenath, and in the ascent thereto the above described schist is observed to pass into the same kind of soft earthy black rock, which was described at Dhol. It was here that the graphite was discovered, (alluded to in Art. 270,) lying on the surface in lumps, the fragments of kidney or egg-shaped nodules. The largest specimen obtained, however, was an oblate spheroid perfectly rounded, and having

a diameter of about three inches. This latter contained small veins of quartz. The aspect of this graphite till scraped or abraded was dull; in the latter case it was metallic. The composition was fine earthy. The fracture uneven, specific gravity —. It appeared to be of a middling quality as applicable to the arts. At the time the discovery was made, I was on the point of leaving Almorah in prosecution of some other views, and I have not since had an opportunity of prosecuting a search after larger supplies by excavation.

273. The mica slate again resumes its ordinary aspect on passing the Peak, and near the village of Betholee has a dip to S. W., being immediately succeeded by a strata of gneiss with a similar dip. This mass is probably connected with that in the valley below, noticed, Art. 269. If so, it would appear to be more of the nature of a vein having considerable longitudinal extent, while a few yards bound it in breadth. In the ascent from the village to the Pass it is again lost, being replaced by micaceous schist. But on the descent gneiss reappears, accompanied by hornblende schist, and extends for some distance. Perhaps after all, these two patches are connected beneath the surface, the micaceous schist of the Pass lying on them. It is possible even that they may both be connected with the Jagesur gneiss, as the latter may be with that observed at Ramesur, and again on the other side with the rock in the valley of the Goomittee. Well devised sections would throw light on this point, and probably develop the general arrangements of these detached patches of gneiss.

274. The Almorah ridge towards the southward, terminates in a mass of granite and granite gneiss, the latter being most abundant. By this term I mean a rock, which in structure seems to be intermediate between gneiss and granite. It is remarkable for containing prismatic nodules of felspar, which gives it a porphyritic character. There is also a good deal of the granan, and there are the same blocks strewn over the surface of the hill as at Dihee. In fact, there is no question but it is the same rock as the two patches observed at Chumpawut and at Dihee. It extends in the east quarter across the valley of the Sowal, ascending the ridge on the opposite side, where it is succeeded by the black and red earthy slate already described, Art. 270. To the south it terminates in the descent to the con-

fluence of the Cosillah and Sowl, being exchanged for micaceous schist, which gradually passes into a talco-argillaceous schist, and latterly, a perfect clay slate. To the westward, it descends the valley of the Cosillah, rising into the lofty peak Seahie Dabee, which is nearly composed of it, and bounded on that side by micaceous schist. A few very narrow veins traverse some of the vallies beyond the limits of this patch, but their connection with it has never been satisfactorily traced.

275. The micaceous schist of Almorah occupies the descent to the Cosillah, with the exception of the narrow strip of granite just noticed. The road to Hawulbagh is in the same rock, and it continues in the route up the valley of the Cosillah, till it is exchanged for the patch of gneiss noticed in Art. 152. On the road to Gulee Busoor, it also prevails, being most commonly of a bluish colour, and containing garnets abundantly. This rock is further remarkable for being traversed by a vein of a singular nature, no name or description of which I have even met with. Near Hawulbagh an instance occurs: It is of a porphyritic character, consisting of thin needles or prismatic bundles of needles of hornblende, imbedded in a white granular paste of felspar and quartz. On the Pass above the village of Aeena, leading from this valley into that of the Sugos, the rock is of an earthy type and very singular aspect. The dip of the schist here (on the Pass) is N. E.  $22^{\circ}$ , the inclination  $50^{\circ}$ . Below the village of Aeena, it occurs of a lead blue and full of garnets, the dip being N. E. In this neighbourhood are many of the porphyritic veins just noticed. Micaceous schist more or less differing in character continues to Mernee, near Dhooara Hat'h, great irregularity being observed in the dip with frequent reversals; near the Sugos it is S. W., which on going a little farther is exchanged for a N. E. dip. In the bed of the river it is again S.  $25^{\circ}$  W., inclination  $34^{\circ}$ . The porphyritic veins are abundant in this neighbourhood. The S. W. dip continues to the junction of the mica slate, with a gneiss which lies conformably; but which is the superior rock, it is impossible to say for want of access to the line of junction, especially as the change takes place in the direction of the strata.

276. This gneiss is introductory to a large patch of granite similar in character to the three beds already described as occurring at Chumpawut, Dihee, and Almorah, and what is still singular, in the same straight line with them; the direction as before observed, being parallel to that

of the strata and of the mountain land. There remains nothing to add to the particulars already given of this rock at those places, as it is here precisely the same in grain, consistency, overlying, amorphous appearance, &c. It appears to pass on its borders into a gneiss. The change at Mernee has just been noticed. Another takes place in the descent to the glen to the N. W. that leads into the valley of the Ramgunga, (Art. 106.) To the N. E. it is I think connected with the gneiss in the Cosillah, (Art. 152.) To the south it is succeeded at no great distance by micaceous schist, but the boundary line was not seen. The schist was observed to dip N.  $27^{\circ}$  E., inclination  $41^{\circ}$ . To the west it passes into the pseudo-porphyrific gneiss, noticed at Almorah, and which near Mythana is succeeded by a black micaceous schist. Near Palee, however, the gneiss is again seen, containing nodules of quartz, and some very singularly lustrous veins of a material, the same essentially as the basis, only much harder. At no great distance on each side, micaceous schist is recognised.

277. In the descent to the Ramgunga, micaceous schist reappears, and continues as far as the confluence of the Beneegunga. In the bed of the former river, the number, size, and variety of the rolled stones is quite surprising. They occur at a height of 200 feet above the present bed of the river, and many of them are of a totally different nature from any of the rocks in the immediate vicinity. The micaceous schist continues in the Beneegunga; at its mouth it dips  $32^{\circ}$  N. E., the inclination  $31^{\circ}$ . Beyond Tamba Dhar, it is again succeeded by gneiss, which is distinctly stratified, and dips N. to N.  $13^{\circ}$  W., at an angle of  $52^{\circ}$  to  $57^{\circ}$ . It is worthy of remark, that part of this rock is a perfect micaceous schist, containing no visible traces of felspar, yet there is no separation, nor any transition in the usual sense, nor disturbance of any kind. To the eye, it seems to be part of the gneiss, but on examining it, the characteristic ingredient is found wanting, while in the remainder of the mass, it is obvious enough lying in lenticular imbedded nodules, which on the cross fracture, give the rock an appearance not to be mistaken.

278. Another observation of the dip, a little beyond this point, gave N.  $22^{\circ}$  W., the inclination  $43^{\circ}$ . Quartz rock and micaceous schist next succeeds, and continues to Deoghat. At this place, the route turns up the bed of a feeder of the Beneegunga to Ketureea, and in



this line a rock oscillating between granite and gneiss continues the whole way. It appears to divide into cuboidal masses, or rather into parallelopipeds, one of the surfaces of which, apparently coinciding with the planes of the strata, gave a dip of N.  $22^{\circ}$  W., inclination  $36^{\circ}$ . Near the Dawk chowkee, it is observed in immense rounded masses lying in the bed of the river, and I think having more the character of granite than the masses in situ. In this the felspar, which is of a greenish grey colour, and its lustre being highly translucent, is very remarkable for the size of its concretions, and their imbedded appearance giving the rock very much the appearance of a porphyritic granite. This rock has an analogue at Almorah, and on the summit of the Choor Peak.

279. The gneiss continues to put on the appearance of being divided by several sets of seams into more or less regular masses, and its structure becomes less decidedly schistose. An observation of the dip gave N.  $10^{\circ}$  W., with an inclination of  $72^{\circ}$ . It contains the same felspar that I have just noticed as occurring in the rolled masses of granite, a little beyond the 243rd kos stone\* the dip was observed S.  $20^{\circ}$  W., inclination  $50^{\circ}$  to  $60^{\circ}$ . Latterly near Thanna, it gives way to a micaceous schist, remarkable for the great size and imperfect shape of the garnets it contains. The round blocks of granite of great size appear still in the bed of the river. From Thanna to Muse, and again in ascending the high range over which the road to Ran leads, no rock but micaceous schist is seen in situ. Above Masoo, it occasionally contains kyanite, but not in any quantity, or of any size or beauty of appearance. On the summit of the Pass, the same rock is found dipping N. E. at a considerable angle. Half way down the descent, blocks of gneiss in great number and of great size are seen, many of them occupying such situations as will not admit of our supposing for an instant, that they have ever been in motion, or occupied other than their present sites. At the village of Ran, micaceous schist is the rock dipping N. E.

280. From Ran, the route descends to the bed of the same nullah in which micaceous schist is still observable, and thence ascending to Kunoobut near the latter place, we come again upon a district of gneiss

\* The Goorkhalee Government had erected these stones at distances of a kos along the line of road from Katmoondo to the Sutlej.

rocks, which occasionally appear to pass into the common earthy micaceous schist, occasionally into an amorphous granite. It contains schorl occasionally in nests. The boulders are very numerous, and the granite is in places a perfect granan. The gneiss, when well defined, contains garnets. Hence to Dhout, the latter rock and micaceous schist may be considered the prevailing rocks. On the summit of the Pass above, gneiss is also found of that type, which inclines rather to micaceous schist than to granite. Hence descending, the granite is again met with, but under relations which will bear a little more detail.

281. The appearances I am going to describe may be seen a little to the east of the village Dhooet. In a geological sense, the rock may be called a gneiss, but it exhibits small patches, (forming regular transitions amongst themselves,) of the most regular micaceous schist, (earthy type,) and again of the most legitimate granite, (granan). These three rocks, so different in composition, in mineralogical character, and in supposed geological origin, may be here observed in the compass of a few yards, all naturally interchangeable, while nothing like a veinous appearance can be attributed to any of them. A long zone or belt is marked by huge boulders of gneiss or granite, (for I could not examine them closely,) strewn over it, and such is the declivity of the mountain side, that we cannot for a moment suppose that they have rolled into their present places. They are in fact like those of Dihee, the harder nodules of a rock many feet in depth, which has disappeared owing to the power of waste. The dip of this rock, which in its gneiss and mica slate types is regularly stratified, is N.  $48^{\circ}$  to  $55^{\circ}$  E., inclination about  $48^{\circ}$ . In the descent from this village, we find the chloritic argillaceous schist mentioned in Art. 116.

282. The whole of these beds are upon the same line, which is, as before observed, parallel to the direction of mountain land and of the strata. In prolonging this line to the westward as far as the Sutlej, only one other locality of granite is met with. This is the Choor Peak, a mountain which rises to the height of twelve thousand feet, and which has no equal or rival within a circle of sixty miles diameter. The shape is that of a long block or ridge running N. N. W. and S. S. E., about one and a quarter mile in length, which rises suddenly on the N. W. extremity into a sharp rocky peak many feet higher. To the S. E., it sinks suddenly into a well-wooded range, where the

rock is with difficulty accessible, but from the indications observable, I should judge it to be micaceous schist. This rock indeed surrounds the base of the high ridge which itself is composed of granite, occasionally of a highly crystalline grain. It appears to contain two different kinds of felspar, one of which assumes that arrangement which may entitle the rock to the appellation of porphyritic. It is a very beautiful rock. The mountain is conspicuous from every other quarter, and in every view of it the summit patch of granite is at once distinguishable from the micaceous schist below by its peculiar rocky aspect and bareness.

283. I have now to give a few details on the occurrence of the sandstone formation which bounds the mountain tract to the South towards the plains. This rock assumes many different aspects here as it does in Europe; upon the whole, the resemblance is sufficiently striking to allow of our identifying it with the newer red or saliferous sandstone, (the red sandstone of English geologists.) It is either a hard red gravelly clay distinctly stratified, or the same clay enclosing rounded stones, or a micaceous sandstone, which in hardness varies from loose sand to a rock that will strike fire. This type is again modified by the admission of rounded pieces passing into sandstone conglomerate. These two rocks form the principal part of the formation. The sandstone is always micaceous in a high degree; it is most commonly of the ordinary colour, but sometimes it is found of a dark bluish grey, in which case it seems to lose its appearance of a schistose structure, and becomes amorphous, breaking equally in every direction. The type is farther remarkable for containing kernels of superior hardness to the base, which itself is more compact, and I might say clayey, than the ordinary sandstone. It also contains less mica. This grey type also passes into the conglomerate structure; besides these, which are the most marked types that have any extent, there are innumerable varieties of very anomalous appearance, chiefly towards the upper part of the rock. The yellowish grey ordinary sandstone often alternates with a rock that might pass for a perfect greywacke. The latter is seldom marked with the strata lines like the sandstone, but is conformable and parallel to it. One of the most remarkable features is the occurrence of ellipsoidal-shaped cavities in the middle of sandstone strata. They are of different sizes. One which I observed measured six feet in its longest diameter, and was quite smooth and regularly curved in its interior.

284. I shall now mention the different places where this sandstone has been observed, adding any other particulars which appear to require it. At Bhumowree, it is seen in the river bed, dipping N. E., at an angle of about  $30^{\circ}$ ; but it has here scarcely any development, and nothing is to be learned regarding it but the above fact. At the Chilkeia defile, we have more access to it. It there forms very extensive strata, chiefly of the red clay type, between Chilkee and Dhikoolee. In the bed of the Cosillah, occasionally rounded stones are contained imbedded. The strata appeared almost horizontal, or at least very slightly inclined. At Dhikoolee, the conglomerate character is perfect, the basis being still the red clay, but sometimes indurated in a high degree. The strata here dip to the North. They are covered by a deposit of loose rounded stones. From this point, the rock is concealed till we reach Chookoom, and there we find a greenish grey sandstone with mica dipping S. W. It is covered by a loose shattered rock of various bright colours, indicative as I have observed elsewhere, of this formation; beyond this point, that is above it, I have not met with it.

285. Specimens brought from Kaloo Shaeede's tomb, at the outlet of the Ramgunga, belong to this sandstone. They were of the grey type, with conglomerate structure. At Hurdwar, it may be studied to great advantage, and all its characteristics examined on the Beemghora Pass, where the construction of a beautiful road, by order of Government, has given two admirable sections of these strata. They are here mostly of the sandstone type, neither the red clay or the conglomerate being common. On the opposite side of the river, however, Chundee Puhar is almost entirely composed of these types. A singular circumstance is the opposite dip of the strata observable at these two places. At the latter, they dip on the Hurdwar side S.  $35^{\circ}$  W., at an inclination of about  $30^{\circ}$ ; while on the other the dip is the N. E., the inclination much the same.

286. This formation has also been examined in the Kheree Pass, leading from the Dhera Doon into the plains. In this quarter, the dip is very regularly to the N. E., or to some point between N. and E. The first strata observable, and which may be supposed uppermost, is the red clay that lies on a stratum of red conglomerate. The Pass is cut through this latter, and a good section of it obtained. The stones are most commonly quartz rock, more or less coloured; pieces of granite

also are observable. Farther on is a perfect sandstone conglomerate; specimens were obtained in appearance perfect greywackes, traversed by quartz veins. The grey type is common, and often appears to pass into a sandy clay, with mica disseminated. Similar phenomena are visible in the Timlee Pass, the other entrance to the Dhera Doon, and in the ascent to Nahun. The Pinjore Doon is shut in to the southward by a low range of hills, composed chiefly of red clay and red conglomerate. West of this point, the formation has not been traced, but it probably extends to the Sutlej, having a greater development where the vallies separate it from the primary strata, and vice versa.

287. There now only remains that I should notice the extent of the deposits, consisting of rounded stones, gravel, and sand. I have already mentioned in the course of the preceding details, the several accumulations that are to be observed in the beds of rivers. But their greatest extent is on the borders of the plain country lying at the foot of the mountain ranges. At Bhumowree, they may be seen resting on sandstone. They reach to Tandaha, a distance of fifteen miles. In great part of this line, the deposit is of enormous thickness, a well having been sunk half way between those places to the depth of 150 feet, without passing through it. At Chilkeeah, they are again seen reaching from the foot of the mountains to Haldoorea, a distance of twelve miles. Here also the deposit must be of great thickness, as ineffectual attempts were made at Chilkeeah also to sink a well; sixty feet was the depth penetrated to, without passing through them. Again at Hurdwar, they have been traced as far south as Bhogpoor, a distance of ten miles, pieces of granite being observable amongst them. On the Kheree Road, they are seen for an equal distance to the southward, and on the Beput Road the same. But the most extensive collection of them by far is in the Dehra Doon, the whole of that valley being, as it were, filled up with them. A well which has been sunk there by the Hon'ble Mr. Shore, attained a depth of 220 feet, before a good and plentiful supply of water was met with; even at that great depth, the nature of the deposit was the same as at the surface. Mr. Shore has preserved notes of the particulars observed in the course of the work, and has kindly allowed me to take a copy of them. I shall here give them, as forming a very interesting contribution to our knowledge of the geology of these mountains:—

<i>Feet.</i>	<i>Total.</i>	
5	5	Fine black mould, with a few stones.
4	9	Reddish earth, mixed with gravel.
9	18	Loose sand and gravel, large stones.
2	20	Ditto, with reddish clay.
3	23	Stiff reddish clay.
8	31	Stiff yellow clay.
3½	34½	Sand and gravel, mixed with a little red clay.
1½	36	Stiff reddish clay.
2	38	Sand and gravel.
22	60	Stiff red clay.
2	62	Clay sand and gravel mixed.
16	78	Sand and gravel.
12	90	Stiff yellow clay, with a little sand.
35	125	Sand and gravel, a few round stones.
3	128	Sand, large blocks of conglomerate north and west side.
3	131	Ditto.
13	144	Sand and gravel, with tolerable sized stones.
5	149	Ditto ditto, stones larger.
9	158	Ditto ditto, with pieces of conglomerate.
4	162	Ditto ditto, with enormous stones.
6	168	Conglomerate on three sides, gravel the fourth.
3	171	Sand and gravel most; occasionally pieces of conglomerate.
3	174	Conglomerate, blocks of.
3½	177½	Layers of sand and gravel, pieces of conglomerate.
4½	182	Sand and gravel.
½	182½	Conglomerate 4 inches thick, under it water, but scanty.
2½	185	Sand and clay.
½	185½	Conglomerate.
18½	204	Sand and gravel, rather loose, occasionally pieces of conglomerate, occasionally solid blocks 160 lbs. in weight.
5	209	Sand and gravel, very moist.
½	209½	Conglomerate, over half the well water.
1½	211	Red clay.
7	218	Sand and gravel, very moist, water.
3½	221½	Blackish clay, with angular fragments of clay slate.

288. The extent of these deposits has not been traced so recently to the westward, but no doubt is entertained, that they attain there also an equal extent, judging from the recollection of former journies. Below Nahun in particular, and near Munta Dihee, at the exit from the Pinjore Doon, very clear traces of them are to be seen. That the Pinjore and Kyarda Doons are, equally with the Dehra Doon, composed of them, I have no doubt. It ought to be stated, before concluding, that in the Dehra Doon, the great thickness appears to be in the centre where the ground is highest. Towards the vallies of the Ganges and Jumna, they diminish very much in thickness, and in the beds of those rivers, may be observed resting on sandstone.

289. Southward of these rounded stones, a very extensive deposit of the red clay, which is very similar to the red strata of the sandstone, prevails. It has often small patches of loose sand. This red gravelly clay lies in a blackish clay of a purer character, very stiff and tenacious at different depths in different places. This latter appears to change to a lighter colour as we descend, and becomes more arenaceous, till at length it changes to a grey sand. My enquiries and observations have not yet been sufficiently general to allow me to identify these deposits with any thing like certainty, indeed it is only very lately I have been able to turn my attention to the subject, and the recent arrival of the boring engine I had ordered from England, precluded the possibility of constructing a proper apparatus and scaffolding for using it with effect, unless the operations were delayed till the ensuing year. I was therefore obliged to content myself with such results as could be obtained without the proper means, and was not able, in consequence, to penetrate beyond twenty-two feet in any of the bores I made; but I hope on my return to the field duties, that I shall be able to continue these enquiries with greater effect.

290. In the meantime, it may be interesting to give the particulars of the few bores I made. The first was at Moradabad, but being new to the operation, it took several days to bore sixteen and a half feet, the particulars were as follows:—

*Feet. Inches.*

- |   |   |  |
|---|---|--|
| 4 | 0 | Superficial sandy loam forming a very productive soil.   |
| 2 | 5 | Brick earth. This is the red clay, which prevails so extensively in Rohilkund, and which so often comes to the |

*Feet. Inches.*

surface, forming a substance of a singular hardness, and excellent materials for roads.

- 3 7½ Reddish micaceous sand. The temperature at this depth 16½° was found to be 76° 5'; a thermometer in the shade marking 58°, and the surface of the ground being 56°.

291. The next boring was at Kusherpoor, where the red clay has a very extensive superficial development. It forms the step described in Arts. 59 and 73, which gives so deceptive an appearance to the direction of the fall or declivity. The spot where the boring was made, was about twenty feet below the surface of this red clay, and the following were the particulars :—

*Feet. Inches.*

- 2 3 The superficial red clay.  
 1 3 Green sandy clay, water.  
 4 6 Black clay, extremely tenacious.  
 1 6 Light blue sand. The water was in such abundance, as to prevent any further progress ; it speedily rose to within a few feet of the surface. At Huldoon, seven miles north, nearly similar results were obtained.  
 5 6 A ferruginous sandy clay or loam, latterly becoming more stiff.  
 1 6 A greenish clay, getting latterly blackish.  
 2 0 A bluish grey clay, partially sandy, not so tenacious, and quite moist. Gravel under this. The water rose rapidly, and prevented any further proceedings.

292. At Jusspore, nine miles N. W. from Kusheepoor, a third boring was made, but the place was injudiciously chosen, being in a hollow, evidently the dry bed of a jeel. The following are the particulars :—

*Feet. Inches.*

- 5 0 Surface sand, which gradually changes to a stiff red clay.  
 2 0 Red loose sand, damp.  
 2 0 Variegated sand and clay, spotted.  
 3 0 Yellowish sand, changing to light grey, twigs and roots were found at nine feet, water at 12.



293. At the next place we find the same deposits as at Kusheepoor and Huldoon.

*Feet. Inches.*

- 2 0 Superficial loam.
- 3 6 Clay; temperature 68°.
- 1 6 Sand.
- 1 6 Clay again.
- 1 6 Sandy clay, twigs.
- 2 3 Stiff clay, latterly blackish.
- 1 6 Ditto, of a darker colour and more pure.
- 1 0 Grey sand.

Water rose to within a few feet of the surface.

At Afzulgurh, the following particulars were noted:—

*Feet. Inches.*

- 6 0 Superficial loam small nests, and veins of a semi-carbonised vegetable matter.
- 2 6 Red sand, a quicksand.
- 4 0 Blackish stiff clay.
- 3 6 Stiff clay, latterly sandy.

The quicksand falling in prevented any further operation. The black clay proved to be an excellent potter's clay, and baked without changing colour. It formed a very porous article, and was very acceptable to the potters, who were ignorant of the existence of any such clay in their neighbourhood.

294. At — the following particulars were noted:—

*Feet. Inches.*

- 7 6 The superficial loams yellowish, and more sandy latterly.  
It forms an excellent soil, and is known by the provincial term *moteear*.
- 2 3 White micaceous mixture of sand and clay.
- 1 6 White clay, a little sandy.
- 1 0 Brownish black clay, containing semi-carbonised vegetable matter.
- 2 6 Dark bluish clay, very stiff, when wet almost black, latterly veins of light blue.
- 6 0 Clay much iron shot, and passing to sand.
- 1 6 Dark bluish clay, as before.
- 5 0 Sandy clay, much iron shot.

The temperature was observed to be 73°, once at six feet, and again at eight feet, that of the surface being 59°.

295. I have here concluded the geological details; some few particulars have been omitted in their places, but will be hereafter inserted with fresh matter, which I hope will render it something more complete. I have principally to regret, that the circumstances under which these papers have been prepared, have prevented the execution of the original design of referring in the account of the occurrence of rocks by number to the particular specimen collected. Such a practice will be of very great advantage, and will indeed give the above detail far more authority, than it could possibly otherwise have. I shall now proceed to state, in a few words, the general results to which they lead.

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### SECTION III.

#### RECAPITULATION.

296. In the details just given, I have necessarily entered into a minuteness of description, which to the general reader must be tiresome in no small degree. The paper being intended as a record of observations, it was necessary to be particular; but I shall attempt in this section to throw together the general results, comparing them afterwards with received opinions, and illustrating the whole in the best manner my limited reading will permit.

297. It appears then, that in these mountains gneiss occupies the greater part of the surface, forming a band of 24 miles in breadth, and including within its boundaries all the elevated summits, but one, of the table, at Art. 39. Of these all that have been approached sufficiently near to determine the point are certainly gneiss, that is, if distinct, thin, and well-marked strata be any ground for deciding. Other evidence there can be none, as it is impossible, by actual examination, to ascertain what rock is at the summit. It rises then most probably to the height of 25,709 feet,\* while the lowest point is only elevated 2,800.

\* Captain Webb gives 25,669 as the height above the sea—*Journal of Science*. The paper by Major Hodgson and myself in the 14th Vol. *As. Res.* has 25,749. I have taken the mean.

If we suppose the lower strata continuous across this tract, and allow for the inclination, we shall have eight miles for the extreme thickness of this formation, and about six for its mean value.

298. The direction of this zone of gneiss is generally, I might say almost always, North 60° West, being thus parallel at once to the direction of the line of greatest elevation, and also to the general bearing or tendency of the mountain land. The inclination lies between 20° and 30° in by far the greater number of instances. It is, however, sometimes, though very rarely, as high as 50°, and in one solitary instance was observed to be 56°. There are very few reversals of the dip, at least towards the centre or middle of this zone; but along the southern boundary, which is very irregular in its outline, forming various incursions into the adjoining zone of schists, there do occur several irregularities both in dip and inclination, and the former is sometimes reversed. That it is pretty regular in general, however, is proved by the fact noticed by all travellers, of the uniformity of aspect in the sides of slopes and precipices in these mountains.

299. The character of this rock is highly crystalline, and it appears to consist almost always of the regular ingredients, and united in the usual regular proportions. It is surprising how few varieties present themselves in so extensive a tract of country, and in general, these varieties differ more in colour and grain than in mineralogical character. The occurrence of imbedded minerals is rare, and of these only, the most common have been observed, as quartz, garnet, and kyanite. It is almost equally barren in beds, containing only some very small ones of hornblende rock, quartz, limestone, and mica slate. Of the two last, I do not know more than one or two instances of each. In fact, there is a character of sameness throughout this formation, extremely tiresome to the geological traveller, as continually disappointing him in his hopes of meeting with something new and interesting.

300. Veins of granite are numerous, particularly towards the central or highest parts; but no beds have yet been found, the granite of Wongtoo being supposed to be veinous. Towards the boundary, however, there are some patches, which would appear to have some connection with a series of beds found beyond the limits of the gneiss, and surrounded generally by rocks of a more earthy and less crystalline character. These latter beds have been described as occurring at

Chumpawut, Dhee, Almorah, Shae Debee, Dooara Hath, Palee, Dhoect, and Kunyoor. They are situated in the zone of minimum elevation, and a line passing through them has a direction of North 60° West, the same as that of the strata and zones of different elevation. West of the Ganges, no such beds are found, unless we suppose the Choor granite, (which is certainly on the prolongation of this line) to be one, and then it will be the only one. Another anomaly which the granite of the Choor presents is, that it occupies the highest point in all the mountain tract, south of the zone of greatest elevation, whereas the eastern beds are situated in the lowest ground. A third difference is in the character of the rock, which in the case of the Choor granite, is highly crystalline; in most of the others, earthy and decomposing. Yet it must be confessed, that they present some differences of aspect in this respect, and that at Chumpawut, Dhee, and Almorah, very hard and crystalline granites are procurable, though at the two latter places in limited quantity.

301. The grain of the veinous granites is, as has been often remarked, large; in variety of composition too, they form a singular contrast to the uniformity which distinguishes the gneiss. In this respect, they also differ from the beds of granite, which are strikingly alike in mineral composition, colour, and size, and arrangement of grain. In these particulars, the Choor granite is almost precisely that of Almorah, though separated by such a wide interval. What distinguishes this granite at first sight is, its porphyritic structure, and it evidently contains two distinct varieties, if not species of felspar.\* This variety is seldom found in a crumbly decomposing state. The only other well defined type is that which is so remarkable for its rapid disintegration, in which the ingredients appear to be united in the usual irregular manner. This contains a large portion of white opaque felspar, and it is well distinguished by its granite boulders, the true nature and history of which have been so well laid open by Dr. Macculloch.

302. Smaller veins have not been observed to affect the appearance of the including rock, but the vein at Wangtoo, the only large one

\* The existence of several mineral species hitherto confounded under this title, has been now clearly established, and I anxiously look forward to a period of leisure, when I may submit the different granites to a particular examination with reference to this point.

I have seen, certainly is in contact with a rock forming a transition between granite and gneiss. With regard to the beds, they also present in general the appearance of a thin band of gneiss surrounding them, and outside of this is found mica slate. The whole being included in clay slate, no change in the latter rock has even been observed. It is almost unnecessary to say that none of these beds are stratified,\* that is, the central nucleus; but as before stated, they appear to pass into gneiss on their boundary. The only imbedded minerals are schorl and quartz, (rhombohedral schorl and rhombohedral quartz.)

303. Conterminous with the gneiss may be found a series of different rocks all possessing the schistose structure, micaceous, chloritic, and talcose schists; whether all to be included under one head, is a point for the determination of which data are as yet wanting. But it is perfectly certain, that there is no such thing as a general and continuous formation of micaceous schist (the next rock in our systems) analogous to that of gneiss; several large patches of micaceous schist occur, but they are separated by equally large tracts of other schists. Perhaps the above three schists might be conveniently considered as one formation, although we should even then find our systematic views disturbed by the intrusion of schists of an argillaceous character. These latter may be seen even in contact with the gneiss. Thus we shall be forced to modify a little our ideas of the exclusive nature of formations, and in admitting argillaceous schist as a member of the series, we shall establish, as succeeding the gneiss, a zone of schistose rocks of nearly equal extent, but not presenting the same appearances of regularity of position, or uniformity of mineral composition.

304. In considering the subject, I have been certainly inclined to view this latter account as most consonant with the phenomena. But it is possible that a more particular examination of the boundary of the gneiss may establish the first view, and in this case, the gneiss with which the argillaceous schist is in contact, would belong to a different era from that of the zones of greatest elevation, whereas I have suppos-

\* The stratification of granite, a favourite tenet of one of the rival schools of geology appears to be losing ground every day. Mr. Greenough long ago, in his critical examination, shewed the extreme laxity with which this term stratification had been used. In the sense in which most unlearned people understand it, I apprehend that granite can never be said to be stratified. After all, however, it is a mere dispute about words, and seems, whichever way determined, to throw no light on the subject of the origin of rocks.

ed them to be connected. This is one of the difficulties attending so early an attempt to generalise ; for the present it may be sufficient to view all these schists as constituting one formation. This formation will then be found to be of nearly equal extent with that of the gneiss, being in breadth — miles, and stretching, as that does, from river to river, it will terminate in those mountains which form the northern boundaries of the several Doars, and in the line connecting them.

305. In this method of viewing these rocks, it may be stated, that there is but one general formation (of primary rocks,) besides that of the Himmalaya gneiss,\* and it is worthy of remark, that they divide the whole tract pretty equally between them. The schistose formation is no doubt stratified, though, it is thought, not so regularly as the gneiss, and its strata are often much more inclined, much more contorted, and present greater irregularities, both of curvature and reversal of the dip. It is, however, to be noted, that mountains of this formation do not present the same facilities for examining the strata, as those which are composed of gneiss. Being in general so much more subject to decay, they have a very thick bed of local debris which effectually conceals the rock in situ, and in such cases, the character is necessarily taken from that of the debris. The effect of this is to give these mountains a rounded and softened contour, which distinguishes them at once from the serrated and bare rocky ridges of the gneiss formation.

306. The mineralogical character of these schists is variable; but this is not only true of the whole formation, viewed as comprising rocks to which distinct titles have always been allotted, but also of the varieties which are referable to any one of those titles. And the many anomalous rocks produced by the intermixture, and transitions of these, form a numerous band, strictly speaking, belonging to none of them considered by itself, and therefore strengthening the view I have taken of the

\* In confining the number of primary formations in so extensive a tract to two, I may be thought to indulge in too large a generalisation. It may be said, that many of the beds I mentioned as contained in the clay slate, may be in fact formations. It is proper, therefore, that I should explain what I mean by a bed ; for half our mistakes in geology are occasioned by using words in a wrong sense, frequently in no sense at all. By a bed then I mean, a mass not veinous, which is surrounded on every side by the same rock. It may be stratified or not ; it is unnecessary to add the term subordinate, as this definition includes that idea. It has another advantage, that it involves no theory.

entireness of this formation. These varieties, at least all those that required it, have been described already with sufficient minuteness. It may be here a sufficient recapitulation to say, that the argillaceous schist, as it covers the greatest extent, so it presents the greatest vacillation in character. No opinion can be more void of foundation than that which supposes the several varieties of clay slate to be arranged under four different, distinct, and well marked types, the produce of four different eras, and distinguishable by characters mainly dependent on colour; so far from dividing into regular zones, or even isolated patches, the different varieties are found in every part of this extensive tract. Excellent purple roof slate; stone slate passing into flinty slate; a black almost arenaceous rock, with patches of white resembling the ash of half-burned charcoal; a white arenaceous rock with scales of mica; a soft schistose clayey rock of various bright colours, and a granular yellow rotten stone; all these are found in a space of not three miles square. From my own very limited experience, I would say, that of all distinctions, colour in clay slate is the most vague, and least to be depended on.

307. This tract of schists contains numerous and extensive beds of limestone, frequently enclosing veins of galena, (hexahedral lead galena of Mohs,) beds of dolomite (macrotypus lime haloide,) and potstone (prismatic talc mica, the massive variety,) either singly or in conjunction, and containing in each case veins of copper and iron pyrites, (pyramidal copper pyrites and hexahedral iron pyrites,) purple and grey copper (octahedral copper pyrites and tetrahedral copper galena,) beds of red and brown iron ore (rhombohedral and prismatic iron ores,) veins or beds of graphite, (rhombohedral graphite mica,) and superficial amorphous masses of gypsum (prismatoidal gypsum haloide.) But the most remarkable of all its subordinate mineral masses is the greenstone, which is so often met with, though limited as to extent. Connected probably with this rock is the series of fragments, obtained near Bhumowree, presenting types of amygdaloid and porphyry. But the whole subject is as obscure, from want of observation, as it is interesting, and the fact of the only series of lakes within these mountains being found in the neighbourhood, enhances the interest extremely. Indeed, it is not a little difficult to restrain our premature efforts to connect these facts with a well-known theory, remarkable for the origin it assigns to these rocks.

308. Southward of the great belt of argillaceous schist, which forms the plainward termination of the series of schists, we find a narrow strip of secondary rocks, mostly, if not entirely, the newer red or saliferous sandstone. This formation presents little to interest us, excepting in the promise which its position here gives of more valuable deposits further South. It is always stratified, and the dip is most commonly conformable to that of the primary strata. At Hurdwar, the strata on opposite sides of the river dip in opposite directions. It differs extremely in character, being sometimes a red clay, which occasionally contains rounded stones, sometimes a regular sandstone conglomerate, often loose sand. It is remarkable for the quantity of mica it contains, and for the series of bright colours it presents often within a very short distance. It contains brown coal (bituminous mineral coal,) but in what quantity is not known.

309. Lastly, we have lying at the southern foot of this sandstone range, and also occupying the several vallies bounded by it, a deposit of great depth, but not disposed in strata, consisting of gravel and sand, including large boulders or rounded stones of every magnitude up to three feet diameter. The extent of this diluvium, as we may call it, is very great, it occupies a track 192 miles in length, and nearly 10 in breadth. But the length is probably much greater, as it is not unreasonable to infer, that it is conterminous with the sandstone range, which certainly extends from the Indus to the Burhampooter. Outside of the tract of diluvium, a red earthy marl is found intermixed with patches of sand, and a blue clay, very similar in character to that of the London clay, is found to underlie these. In the neighbourhood of Hansee, a fresh water limestone is met with, containing perfect shells of the genera *melania* and *planorbis*.

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## CONCLUSION.

### SECTION IV.

310. From the particulars given in Section I, may be collected the fact of a considerable difference of physical aspect between these mountains and the Andes, the chain with which it has been most usual to compare them. Instead of the confused and irregular appearance, the



endless and complicated ramifications, the ragged and steep acclivities, the total absence of vallies or level ground, the lofty summits and deep ravines there described, we have in the latter an arrangement of two parallel chains or ridges running for a distance of 500 miles, and enclosing between them a broad and elevated table land, constituting one of the finest countries in the world; again the numerous volcanoes, extinct or igneous of the Andes, the terrible earthquakes, the torrents of mud and water so frequently discharged from openings suddenly occurring, and the uprising of considerable mountains; all these circumstances belong to a totally different order of things from that which prevails in the Himalaya.

311. The difference in physical features is not greater than that which appears in the geological character of these two rival chains. In the Andes, as we learn from Humboldt, there is an extraordinary developement of porphyry and trachyte, the more elevated points being composed almost exclusively of the latter rock. Trachyte is confessedly a volcanic production, though the rival schools are at variance with regard to porphyry. Yet, M. Humboldt in his latest work, appears to incline to the opinion of its also being of igneous origin.\* We may further notice the great deficiency of primary formations.† Granite and gneiss are only found in masses of any extent near the sea coast and at low elevations, while the transition clay slates and secondary sandstones attain a developement and an elevation, of which there are no other authentic instances.

312. In the Himalaya again, we have seen that neither trachyte nor porphyry, nor indeed any volcanic or trap rocks are to be found. The whole series, as is evident from the details in Section II., is composed of primary formations, and chiefly if not entirely of gneiss,

\* Or ought we not rather to admit that the domain of volcanic action has been too much limited, and that these porphyries are, with respect to their origin and relative age, connected with trachytes, as the trachytes formerly confounded with trap porphyries are connected with basalts, and real lava ejected by burning volcanoes? Humboldt *Gisement des Roches*, English Translation, page 157. Again, "In Equinoxial America, the limits between transition porphyries and real trachytes known to be volcanic rocks are not easy to fix." *Idem*, page 155. For other instances of this opinion, see page 156 to 160.

† In the Cordilleras of the Andes, of Peru, Quito, Grenada and Mexico, among that innumerable variety of porphyritic rocks of which the masses attain from 2,500 to 3,000 toises in thickness, I did not see a single porphyry that appeared to me decidedly primitive. Humb. *Gisement des Roches*, English Translation, in p. 124.

succeeded on each side by an extensive band of schistose rocks, enclosing a variety of subordinate beds, the whole being of the clearest primary character. Organic remains are, it is true, stated to have been found at a great elevation northward of this chain, but nothing of the kind occurs within the zone of greatest elevation, nor within the mountain tract south of it. It is, however, believed, that with regard to the great elevation of the transition and secondary formations, parallel examples to those of the Andes may be found in the prolongation of the mountain barrier to the north. The subject has not yet been fully investigated, but there are presumptions in favor of this opinion deducible from the arrangement of the strata. The following particulars may be stated as the sum of what is actually known on the subject:—

318. No organic remains have even been found within the tract which I have asserted to consist of primary formations. But they have been brought from a place north of the zone of gneiss, and though there are doubts as to the localities of some of these specimens, it is quite certain that in one instance, ammonites have been observed in great numbers, at an elevation exceeding 16,000 feet.\* What makes this occurrence particularly interesting is, the fact of the limestone in which these ammonities are found occurring at no great distance from the boundary of a gneiss, which if it be not actually connected with, is not distinguishable in mineralogical character from that of the Himmalaya.

319. Ammonites, mineralised by clay slate, have been brought by natives, and as they aver, from no great distance from our frontier on the Neetee Pass. I have also seen specimens of belemnites mineralised by calcareous spar.† But neither these, or the preceding more authen-

\* I have never had an opportunity of examining these fossils, but the identification of the species would throw no light on the question which is here being considered, as it is generally agreed by geologists, that however uniform the mineralogical character of rocks may be in the most distant localities, yet with regard to organic remains, no assistance can be derived from the *characters of species* in identifying formations, unless in a country of very limited extent. Even the hitherto generally received opinion of the universality of formations begins to be questioned, and a doubt entertained whether the granite of Cornwall, for instance, and of these mountains were formed or even assumed their present places at the same time.

† It has been made a question by a geologist of deservedly high reputation, whether the occurrence of organic remains (speaking generally) should be considered *ipso facto*, a decisive argument against the primary character of a rock, and though authority be against him, yet it is the authority of those who admit of a transition class into which they transfer these anomalous occurrences. Now, as no distinctive characters have

tic observation, where the locality and elevation are actually known, can be considered quite decisive of the fact of secondary formations being found at uncommon elevations. For the occurrence of ammonites and belemnites is by no means universally allowed to be characteristic of secondary rocks; and even by that school which asserts their presence to be destructive of the primary character of a rock, they are allowed to belong to the oldest of the secondary, or what they would call, the transition formation.

320. A more curious fact is that of the bones brought from the neighbourhood of the Neetee Pass, and which Mr. Buckland has recognised as belonging to the same era with those of the caves, the history of which he has so ably illustrated.\* As this fact would establish the identity of the deposit in which they are found, with that which he has called diluvian, and which is the newest of all the formations, it would certainly be very interesting to settle accurately the locality from which they are derived. But nothing certain is known on this subject further than the negative fact, that they are not to be found south of the Neetee Pass. Hitherto, they have been collected only by natives, whose reports,—never very precise as to particulars the value of which they do not appreciate,—can scarcely be allowed to settle a point of this interest; even their account, however, places them a considerable distance northward of the limits of the zone, marked by the snowy summits of the Himalaya.

321. Thus then it appears, that at present all we know of certain is, the occurrence of a limestone with ammonites at an elevation of 16,000 feet above the sea, and at no great distance from the boundary of the Himalaya gneiss. As to the other organic remains, they are brought from beyond our frontier by natives, but neither the distance or the elevation are precisely known. But granting all that these may seem to prove, as to the great elevation to which secondary

ever been assigned to this class, as have been to the primary and secondary, it is not very unfair to consider this procedure as *something* similar to what is called a *petitio principii*.

\* A collection of these bones belonging to Mr. Traill, which I had an opportunity of examining, appeared to me to be perfectly mineralised, judging from their high specific gravity. Now the peculiar character of the diluvium bones is stated to consist in their being not at all, or at least very imperfectly mineralised, differing in fact very little from grave bones of high antiquity, light, porous, and absorbent to the tongue.

formations attain beyond the limits of the tract which is the subject of this paper, it would still be true, that within this tract no such phenomena occur. The great extent covered by primary rocks, and the total deficiency of the trap or volcanic rocks may then serve to express the entire dissimilarity of geological structure between this tract and the Andes,\* and I think it a point of considerable interest, and worth insisting on, that no traces of volcanic action,† whether recent or otherwise, has yet been observed in these mountains.

322. We have seen that these primary rocks are always stratified, and that the dip in a great majority of instances is N. E., the direction of the strata being consequently parallel to that of the zone of greatest elevation. The inclination also being small, we may perceive strong grounds for admitting the occurrence of comparatively recent formations at great heights in proceeding along the line of dip. Thus at no very great distance from the crest of the gneiss strata, we may fairly expect, as is the fact, a clay slate, and then a limestone with ammonites, and no doubt did our observations extend further to these, we should see succeeding secondary formations, tertiary, and lastly diluvian, so that upon the whole, there is nothing improbable in the accounts of those who assert the ammonites and belemnites to be found at no very great distance from our frontier.

323. An interesting question is here suggested by the view I have taken of the great central tract combined with this conclusion. We know from Patrin, that the great Altaian chain consists like the Himalaya of primary formations. Are not these distant and opposite points

\* For this reason I have been at a loss to understand, how analogy had taught us the primary nature of the Himalaya formations. It certainly appears most natural to compare them with the Andes, in order to deduce analogical inferences. The Andes are not primary, the Himalaya are so: analogical discoveries *a posteriori*, are always to be suspected.

† There is a foolish notion amongst some of the hill people, however, that the great peak, called Nunda Debee, the highest of the range, and consequently in the world, has been known to emit smoke. They suppose the smoke to be from the gods' Choola or kitchen. It is hardly necessary to add, that there is no real foundation for this opinion. The peak is within 60 miles of Almorah, distinctly visible at all seasons, and had any thing of the kind ever occurred, it must have been seen by some of the European residents at that station. It is, however, worthy of mention, that this peak is scarcely ever seen without a small light cloud resting obliquely upward from its summits; such an appearance might be converted by the crazy imagination of a devotee into smoke ascending from his gods' Choola.

connected on each side by rocks of the same character and eras, and is not the interior from which on one side at least these fossils of such different formations are brought, a huge basin or series of basins in which are arranged secondary, tertiary, and even diluvial deposits, surrounded and supported on every side by a gigantic zone of primary formations?

324. It has I know been disputed, whether the same mountain range or chain be, or be not marked by identity of geological structure. Like many other disputed questions, it is one of words, and the solution entirely depends upon the sense in which we use the word range or chain. If we mean continuous line of elevations, in other words a chain of water heads, such is certainly not marked by identity of geological formation. If again, the line of greatest elevation be understood, then we shall certainly find identity of geological structure, but nothing like continuity of surface. Analogy then adds all its weight to the opinion, that the series of primary formations continues quite round the central plateau.

325. It appears then, that the tract with which we are engaged, comprises a very small part of the outward declivity of a barrier of primary formations, the most extensive probably in the world; that these formations have in this particular quarter, a dip directed N. E. or at right angles to the direction of the tract, and that it is probable the dip continues all round to be also at right angles, that is, towards the centre of the great basin which they surround. The crest of these formations we see attains in more than one quarter to a height of 25,000 feet, rising from plains which have a level of 1,400 feet, and this in a distance of 90 miles. Here then, if any where, we may expect to find some clue to lead us out of the labyrinth of geological speculations and hypotheses; some key to the solution of the great problem concerning the origin of the present inequalities of the earth's surface. Could we but obtain access to all the particulars which are to be learned in these interesting countries, geology would very soon assume a different aspect from that which has as yet distinguished her. Perhaps even the small part of it to which we have access, may furnish particulars calculated to throw some light on the principles of a science as yet in its infancy.

326. Saussure has observed, that in mineralogical cabinets, we see every rock have a definite and easily recognised character. No anomalies

or irregularities occur to embarrass us ; none of the transitions or mixtures which are found in nature, and which form the difficulties of the pursuit, “ *La on trouve tout disposé selon le systeme.*” The same may be said of our most approved geological systems. There we find every rock occupying its distinct quarter, and no hint of the great and perplexing irregularities with which the student of nature has to struggle at every step. We have granite occupying the lowest and the highest points, a covering of gneiss resting on the granite excepting at the very highest points, mica slate over the gneiss, clay slate over it again, and so on in regular array, and with the outgoings of the newer and newer strata. At lower and lower levels, such an account of things is no doubt very beautiful, very systematic, and indeed has but one fault, that it is not true. As countries have been examined more particularly, it is found, that excepting in a few grand points, not one country will serve for an exact type of another.

327. We have seen that in these mountains,\* gneiss occupies the greatest part of the surface. Its thickness is considerable, if we adopt the commonly received opinions of stratification.† To this succeed various schists, the true relations and connections of which are very obscure ; micaceous, talcose, chloritic and argillaceous in different places are conterminous with the gneiss. In the schists and in the zone of least elevation, we find a series of patches of granite disposed along a line parallel to that of the direction of the mountain band and strata. Beyond these again, we see an extensive zone of clay slate, in which occasional patches of gneiss also are found, and outside of the whole very limited examples of the secondary strata, which are finally lost in the plains.

328. Here then is a very different arrangement from that just

\* Professor Jameson in one of his latest works mentions the Himmalaya as an example of a granitic chain. It would be interesting to know on what authority he founds his opinion. I have seen more of these mountains than any European, and the only granite within the above tract (beyond which we cannot without great violence apply the term Himmalaya) that I have ever seen consists of fragments in the beds of rivers. I have never had any doubts, and if I had, the occurrence of these fragments would remove them ; but that there are occasionally veins and perhaps larger patches of granite as in other parts of these mountains, but I have never within this tract met with any rock, in situ, but gneiss and its contained beds.

† There are, however, some good reasons for rejecting this indefinite continuity of the strata underneath, at least in the direction in which they appear on the surface.

described. The great extent of gneiss, the limited occurrence of granite, its situation in the zone of least elevation, the want of a regular consecutive order in the super-position of the schists; these are sufficient to shew the total dissimilarity of nature and system. But we shall find much greater differences than these, as we descend to the details. It has been supposed, that in every chain of mountains, the strata dip outwards, that is, from the summit the dip on opposite sides is in an opposite direction, and it is obvious that such must be the state of things, supposing the origin of the stratified rocks to be as Werner has taught. But in these mountains this is by no means a description of the fact, for the strata, abstracting local exceptions, have but *one* dip, and that is, on one side towards the chain, on the other from it. The same arrangement obtains in the ghauts of Rewah and Bundelkhand, that is, their dip is only in one direction; and it is worthy of remark, that the precipitous side in that chain is also directed towards the great diluvial valley of the Ganges, which is thus bounded on opposite sides by the perpendicular faces of the strata.

329. Such being the arrangement which obtains, it becomes difficult to understand clearly the order of super-position of the rocks that are found south of the gneiss tract. It is no doubt a very singular feature in the structure of these mountains, and is the more interesting, as being apparently in direct opposition to opinions which have been so generally received. In the accompanying diagram,\* it is evident that the gneiss strata at A. prolonged, would be over those at B., which succeed the gneiss in travelling southward, and this remark holds good throughout down to the plains, for the strata always dip conformably or sufficiently near, so as to establish this conclusion. Were the effect to stop with merely placing clay slate or mica slate superior to the Himalaya gneiss, there would not be the actual difficulty; for we know, that within certain limits, there is no exact and universally true order of super-position, though the contrary is stated by systematic writers, (Art. 12.) But in this particular case, the most generally received position in geology would be violated, for by supposing that no dislocation or separation of the strata has taken place, we should have clay slate,

\* We trust, as before stated, that the figures and diagrams will be recovered with the geological map, when we shall not fail to give them to the public.—ED.

primary limestone, mica slate, and lastly gneiss, all resting, and in this order, on a secondary conglomerate !

330. Are we then to say that this latter is really the case, and that even those facts most generally received, and as yet disputed by no school or sect however sceptical, are often all but partial and local occurrences, and not examples of a general law applicable to every country ? Or is there any way of viewing the subject by which we may escape from so startling a conclusion ? Will any dislocation, subsidence, or elevation of the strata explain the difficulty ? I think not ; for besides the enormous extent of the fault which we must suppose to account for the schistose strata, (at least eight miles in thickness and thirty in breadth,) appearing to dip beneath the gneiss strata, a fault which startles the imagination by its magnitude, we have also to believe, that at each junction of two different formations, a similar fault occurred. This is an assumption evidently gratuitous, and not having even a seeming of probability to recommend it. And in two instances, probably in many more, the appearances as described leave no doubt as to the fact of the newer rocks lying under the older ; that is, if we suppose the strata continuous underneath. In these instances, no dislocation whatever will explain the anomaly. The difficulty appears to me to be real, unless we give up those views of stratification which would identify them with the parallel and consecutive layers of mechanical deposition.

331. It is an opinion gaining ground every day amongst geologists, that the seams of stratification are not always what they have been supposed,—the effect or sign of mechanical subsidence ; and many other facts besides this, militate against the supposition we are considering. Were those layers really deposited from a fluid by the effect of gravity, how are we to explain the sudden changes which are often seen to take place in strata, not vertically, but horizontally, and this repeated often in a very limited space. ? That what is called concretionary structure may sometimes produce parallel seams, we see in the case of those clay slates in which what are supposed to be the planes of stratification, are not parallel with the schistose planes. And that parallel seams, not to be distinguished from those of stratification, may originate in some other cause, is also obvious from the fact so often observed of two, and even three sets of these seams occurring



in the same rock; thus creating a difficulty of saying which is or which is *not* the set indicative of the strata. If we admit then with some of our most celebrated geologists, that in the older rocks the planes of structure have been erroneously attributed to stratification, the difficulty with which we are contending will vanish.\* In this case there will be no necessity for inferring a continuation of the strata underneath, and therefore no violation of generally received notions as to the super-position of rocks. The newer formations will rest on the older, and as in this case, the configuration of the surface could not have had any effect in giving the present dip and direction to the upper strata, (for it would have been the reverse,) it is quite clear that neither in these rocks are the seams significative of mechanical depositions.

332. It is at all events very certain that, in all primary countries, the stratification presents various anomalies not easy to be explained on the hypothesis of the formations being mechanical deposits. It is likewise not impossible, that a more particular examination of our mountain strata may suggest some other explanation, or at all events lead us to view it as less contrary to geological observation than I have stated.† With these considerations in view we may for the present consider the order of superposition as determined by the succession of rocks found in proceeding southward, or at right angles to their direction. We will therefore suppose the schists to be deposited on the gneiss, and the sandstones on the schists, notwithstanding the dip being towards the crest of the chain. We have seen, that the two zones into which, on a large view, the rocks may be divided, are parallel with the direction of the mountain land, and with that of the elevated zone, though not with that of the chains, which, as we have before shewn, have no connection whatever with the geological structure.

\* If we could follow their limits with the eye we should probably find the fact to be as now stated, a view of the subject which may tend to explain the apparent inflections and contortions of rocks in general, and perhaps the stratified structure, in all its varieties, may ultimately be considered as resulting from concretion on the large scale.—*Geol. Trans.* vol. 5, part 1, p. 176.

† See Mr. Weaver's Paper on the Geology of Ireland in the 5th vol. *Geol. Trans.* part 1. Dr. Macculloch and Professor Jameson appear also to be of this opinion. The latter, however, combines with it a less tenable doctrine, that the Earth may be a large polyhedral crystal, and the planes of stratification its cleavages.

333. In the separation of these two facts,\* continuity of elevated ground and identity of geological structure, and which is everywhere so strongly marked in these mountains, we may perceive proof incontrovertible, that the present hydrographical arrangement of the surface has been posterior to the original formation of these mountains; in other words, that their vallies or hollows are effects of denudation, and not of original structure. This conclusion could not be more firmly established, even if we saw the corresponding but disjoined ends of the strata on opposite sides of the valley; such an appearance, however, is by no means rare, as may be seen in the details given in the preceding section. But the proofs need not stop here. For if there be a truth more firmly established than another, by many and various circumstances, it is this of the extensive waste which this surface has undergone, and evidently from causes far exceeding in power any that are now in operation.

334. It is sufficiently obvious, however, that though the system of vallies or drainage, generally speaking, be the effect of denudation, yet we are not to attribute all the irregularities of the surface to this cause. Some it is certain originally existed; some may have been caused by a sinking in of the strata. In the first way, we may account for much of the great depth assigned to vallies in Art. 41. The excavation of a valley of 15,000 feet in depth, and having a slope of nearly 30°, would indeed be incredible whatever force of water we employ, or however long the period we have at our disposal. Even with this abatement, enough remains to stagger our belief. Our incredulity may, however, be softened by recollecting the continually recurring difficulty of accounting for so many openings in the line of the strata, without any marks of displacement or dislocation.

335. There are some facts which, though they throw no light on the manner in which this great change of the surface has been effected, yet are sufficient to shew, that such a conclusion is not to be rejected, even though there may occur a difficulty in explaining all the details. The beds of some of the rivers are, for a part of their course, in the solid

\* One of the first impressions made on the mind in examining the Tortworth district is, that the existing form of the surface appears to a certain extent to be unconnected with the nature of the rocky formations that compose its base, an observation indeed that may admit of almost universal application, and be deemed a maxim in Geology.—*Mr. Weaver Geol. Trans. vol. 1, p. 319.*

rock. In these cases, the depth is often considerable, while the appearance is such, as leaves not a doubt in the spectator's mind, but that the present channel was once filled up with solid rock. This is a conclusion we cannot escape from, however difficult it may be to understand the removal of so many thousand cubic feet of solid rock by the agency of water.

336. In all the river beds too we see that there are accumulations of gravel and boulder stones, all perfectly rounded, and consequently all of them such as have been subject to the action of water. These collections, it appears from the details I have given, are in many cases of very great extent, and frequently occur at a height of even 300 feet above the present bed of the river. That these collections should ever have been formed by such bodies of water as are found at present in their vicinity, is altogether inadmissible. Their extent, the size of the fragments, the distance from which they are derived; above all, their great depth, and the height at which they are found above the present bed of the river, all forbid so incredible a supposition.

337. Even if we could get over these difficulties, and really believe that rivers, which in their greatest power at the present day cannot move one of these fragments a few feet, did yet in former ages, transport for many miles, several thousands, nay millions of them, and accumulated them in heaps many times exceeding in height the greatest depth of the said rivers; even if we could get over the difficulties, yet others greater remain. The tract defined in Art. 71, called the Bhabur, we have seen equally consists to a vast depth of these water-worn fragments, evidently of the same era, derived from the same rocks, and transported by the same causes; so also the several plains or vallies described in Art. 57, *et seq.* contain immense beds, the same in every respect with those found in the river vallies. These it is evident, could never have owed their disposition to the power of rivers, whatever may be said of the former comparatively limited accumulations; because they are found where at present no rivers flow.

338. That there is some connection, however, between the disposition of these beds of gravel and formation of the river vallies, appears evident from the following fact:—In establishing a series of bores along the terrace, I found that the distance from the common boundary of plain and mountain land at which gravel was found, was greater in the beds

of rivers, or in their banks, than on the intermediate ground. Whatever therefore the cause which accumulated these beds of water-worn fragments, we see that it acted with greatest force in the direction of the river vallies.

339. There is another very striking fact which enables us to limit still more precisely the direction in which these fragments travelled. At Hurdwar, it terminates rather suddenly in the low range of hills, which bound the Dehra Doon to the southward. These hills, as I stated in Art. 61, form an uninterrupted chain or line of water-heads, on each side of which they are intersected with deep gorges now the beds of torrents. Those which open to the Doon, it appears, are strewn with fragments of the same kind as those which cover the valley itself; but those which open plainward, contain no fragments but of the rocks in situ, which it also appears are of an entirely different character, and not possible to be confounded. The deposit seems, however, to have continued along the foot of those hills, and even to have left fragments at the mouths of the gorges; but in no case do they extend to any distance upwards.

340. These deposits have been observed in every country in which as yet geological investigation has been carried on, lying at the foot of mountains, and often covering extensive plains, or scattered over the bottom of vallies. Perhaps in no country can they be seen on so large a scale as in these districts. The enormous extent of the bed comprising the Bhabur, and filling up the several vallies, is alone enough to excite all our wonder. They have everywhere been recognised as witnesses of the progressive nature of the changes that have affected the surface of the earth. They have established the fact of at least two eras, that of the original formation of these mountains, and the subsequent extensive denudation of the surface forming the present system of vallies. But from considering all the circumstances of the case a still greater discrimination may be made. It is almost certain, that they owe their present arrangement to some sudden and violent catastrophe. Now, it is not likely that their rounded form, being as they are amongst the hardest of stones, was given them by any other than a cause operating through a considerable period of time. Here then we have proof of a series of actions, which must have been posterior to the formation of the original strata, and which carries up the latter to a still higher antiquity.

341. Nor is this question affected by the doubt as to the origin of these boulders ; that is, whether they have proceeded immediately from the debris of the primary strata, or immediately been formed into secondary conglomerates. It is remarkable, that the nature of the stones is the same in both deposits, the secondary rocks and the diluvium ; the only difference being in arrangement, the former being distinctly stratified, and passing into well-defined micaceous sandstone, while the latter forms a confused heap of gravel, in which stones of all sizes and even angular fragments sometimes are found. That they have originated in the breaking up of secondary strata, is I think, the most probable, although we shall then be puzzled to account for the deposits in the beds of rivers where now no secondary rocks are to be seen. However this may be, it is still worthy of remark that the greatest accumulations are found where the secondary formations still exist.

342. Granting that some such catastrophe in these mountains as a mighty *debacle*, or rush of waters, must have given these beds of diluvium their present place, we shall see strong reasons for supposing, that for a time these waters have been pent up in the Doons or vallies, which extend along the frontier. Have they subsequently broke through this range by their own accumulated pressure, or has any other cause of change assisted in finding an outlet for this series of lakes ? The reversal of the dip on the opposite sides of the river at Hurdwar, is a curious anomaly occurring in such a place, and must, I think, strike every one. Till all the circumstances be known, it is vain to speculate. Whether such fact or any disturbance of the strata is to be observed at the other *debouches*, will be interesting to determine.

343. The theory which has identified this rush of water, traces of which have been found in every part of the globe, with the deluge, as described to us in the Scripture, and which has derived its chief illustrations from the labors of Cuvier and Buckland, has been strongly opposed by the geologists of Scotland. In particular, Dr. Fleming has stated some difficulties with regard to the subject, not easily got rid of. He has shewn, that the silent and quiet rising of the waters, and their equally gradual subsidence, as deducible from the account of Moses, cannot be confounded with a cause which has evidently been sudden, vast, and overpowering. The former we see did not even abrade the surface, for vegetation, and trees even, still remained, whereas

the latter has torn up a vast mass of consolidated strata, scattering their ruins over an extent of many hundred square miles.

344. Granting, however, that these attempts to find a geological theory in the sacred records have been as hasty as ill-judged, we shall not find Dr. Fleming more successful than those whose labors he has overturned, in explaining the phenomena in these mountains. With him it is merely the bursting of a series of lakes, and the diluvium is in his nomenclature, lacustrine silt. The mere alteration of the name is of little signification, nor does it lead us a step further in our search after truth. But here is no series of lakes, no vallies that might conveniently be supposed beds of lakes. The only vallies in the several Doons are beyond the limits of many of the phenomena which their bursting is to explain. Were our geologists always satisfied with shewing what is *not* the cause, the science might make more progress than it has done, but one theory is no sooner laid than another rises to supply its place.

345. In reality, our chief object should be in the first instance to collect facts from every quarter. If the explanation is to be general the induction should be equally so, as well as the data on which it is founded. Our limited acquaintance with the surface of the earth will not allow of our generalising as yet with safety, and it will be constantly found, that the hypothesis invented to explain the phenomena in one country, will be overturned by facts observed in another. Dr. Fleming, in his hurry to establish his own view of the subject, has certainly confounded two distinct, and in many cases, easily recognized classes of appearances; and in truth, the whole of what Professor Buckland has advanced in his *Reliquiæ Diluvianæ* remains untouched, (because it is observation,) excepting his notion of the identity of the cause, the effect of which he has so ably traced to the deluge of Scripture. I need hardly add, that the phenomena in these mountains have a most striking analogy with those detailed in the above work.

346. The hasty generalisation which produced the Wernerian system of geognosy has long been acknowledged, and the fact established that few countries, even belonging to the same formation, present exactly the same arrangement and succession of rocks. The opinions of some geologists have even taken the other extreme, and it has been questioned whether there be any such thing as a general formation quite round

the globe; a continuous one there probably is not, but when we view amidst all the differences that undoubtedly do occur in the super-position and connections of rocks, the many and wonderful coincidences that still remain, not confined to a spot of limited extent, but *clearly* belonging to the whole *tract*, we shall be satisfied that the contemporaneous formation cannot be predicted of these masses in which such resemblances are found; at least they must be attributed to a common origin. When we read in Humboldt, that while in different countries, different plants and animals present themselves to the observation of the naturalist, the rocks are the same in every zone; in every climate we appear to be engaged

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\* \* \* \* \* known list of minerals might be formed, we have so small a catalogue of compound rocks, and these always the same wherever occurring, why should granite always contain quartz, mica, and felspar, and always nearly in the same proportions, however distant the localities? mica slate, mica and quartz, and so on of others. These are questions difficult to answer, but which none can avoid asking themselves who have ever reflected on the subject.

347. In all the grand features of geological character \* \* \* \* \*  
\* \* \* \* \*  
\* \* \* \* \* Himmalaya does not [*coincide*] it is true with that [*of the*] Andes. But it bears a [*very*] close resemblance in general features to the description given us by Dr. Macculloch, of the Western Isles. As on those Islands, so here we recognise the great extent of gneiss occupying in each system the middle and highest tract. In the great deficiency of granite, we see another resemblance and a common difference from the dogmas of the schools, that the highest part of every system of mountain \* \* \* \* \*

\* \* \* \* \* impossibility of discriminating in this point between the primary and secondary rocks. But the most interesting coincidence, at least to me, is in the arrangement of the schists, and their connections with the other rocks. In his chapter on the chlorite series, he has almost completely anticipated every thing I had to say on the chlorite schists of the Himmalaya.

\* A quarter of a page, or more is wanting, where this and the following lacunæ occur, and there is no clue by which even to guess at the writer's views.—ED.

348. The existence of coal all over the world, and always in the same geological situation, is another proof that even in \* \*

\* \* \* \* \* condition or state of things, which must have been common to every country of the globe. Pursuing the analogy taught by the facts learned in the coal fields of England, that valuable mineral has been brought to light in almost every part of the world, it may not therefore be uninteresting to enter into some little explanation on this subject, in order to judge whether the deposit may be expected in this quarter, as in any way connected with the series of facts described.

349. The coal formation though, as has been observed, owing its origin most probably in every country to the action of some general cause, may yet be considered, as far as appearances are concerned, to be a local deposit, inasmuch as it is always of limited extent compared with the other strata. Its place in the system is well marked, nor has any bed of coal worth mention ever been found out of that place. It is known to overlie a limestone, which from its relation to the coal, has been called carboniferous, and which itself lies upon the rock called the old red sandstone, the lowest of the secondary strata. Above the coal measures is found the newer red or saliferous sandstone. Between these two members of the series, it has always been observed to hold its place; subordinate strata occasionally intervening, occasionally being wanting, but the coal never occurring, that is, in any quantity above the latter, or below the former rock.

350. This would seem to be a sufficiently definite arrangement to enable us always to pronounce on the greater or less probability of finding this useful mineral in any tract in which the succession of rocks has been accurately traced. Applying the principle to the present survey, it will be found that limiting facts are wanting, although the general presumption is strongly in favor of the existence of a coal formation. Thus we have the saliferous or newer red sandstone on the border of the mountain tract, dipping N. E., giving the promise of older or inferior deposits to the Southward; and again at Dehli, we have the old red sandstone, leaving it a natural inference, that in the intermediate space, intervening formations will be found.

351. The great coal field of Northumberland and Durham is situated in millstone grit and limestone shale (the upper anomalous beds of the



old red sandstone,) on the outside of which small patches occur of the newer red, and beyond that, a country of schistose formation. On one side it has the mountain or carboniferous limestone, and outside of it, a large band of the red sandstone, part of a mass which occupies the centre of England. The coal field of Wales is separated from the old red sandstone by a narrow strip of the carboniferous limestone. Those of Staffordshire are similarly situated with those of Northumberland. The coal field near Burdwan is covered by the newer red sandstone; all these facts, I think, give a strong probability to the opinion, that coal will be found in the Dooab. The facts that are wanting are such as would limit its position, and consequently give a well-grounded prospect of discovery, before commencing any thing like an expensive search. These facts will be furnished by the prosecution of the survey.

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The concluding section of this Report is that upon the Mineral Productions of the Himalaya, which will be found in Vol. XVIII, Part I. p. 227 of the Trans. As. Society.—ED.

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